

Modular Reconfigurable C4I Interface (MRCI)

Critical Design Review (CDR)



MRCI Critical Design Review - 14 August, 1996



MRCI CDR Agenda (1 of 2)

<i>0800-0815</i>	<i>Welcome & MRCI Introduction</i>
<i>0815-0830</i>	<i>CDR Overview & Purpose</i>
<i>0830-1430</i>	<i>MRCI Design</i>
<i>0830-0900</i>	<i>Identification of MRCI Software Configuration Items, Components & Units</i>
<i>0900-1000</i>	<i>Definition of MRCI Software Configuration Items, Components & Units</i>
<i>1000-1015</i>	<i>Break</i>
<i>1015-1115</i>	<i>Block Diagrams of CSCI's, CSC's, CSU's components and relationships</i>
<i>1115-1130</i>	<i>Program library to contain each CSCI</i>
<i>1130-1215</i>	<i>Lunch</i>



MRCI CDR Agenda (2 of 2)

<i>1215-1345</i>	<i>System Specific Interface Design</i> <i>Common Modules Interface Designs (to SSI & RIM)</i> <i>RTI Interface Module (RIM) Design</i>
<i>1345-1400</i>	<i>CSCI, CSC, CSU Development Status (i.e. existing or new development)</i>
<i>1400-1415</i>	<i>Requirements Traceability to SRR</i>
<i>1415-1500</i>	<i>Summary & Wrap Up</i>



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Welcome and Introduction

Presentation to be made by Colonel Jefferson, DMSO.

Slides provided under separate cover.



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CDR Overview and Purpose

Presentation to be made by Tom Tiernan, NRaD.

Slides provided under separate cover.



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0815-0830 CDR Overview & Purpose

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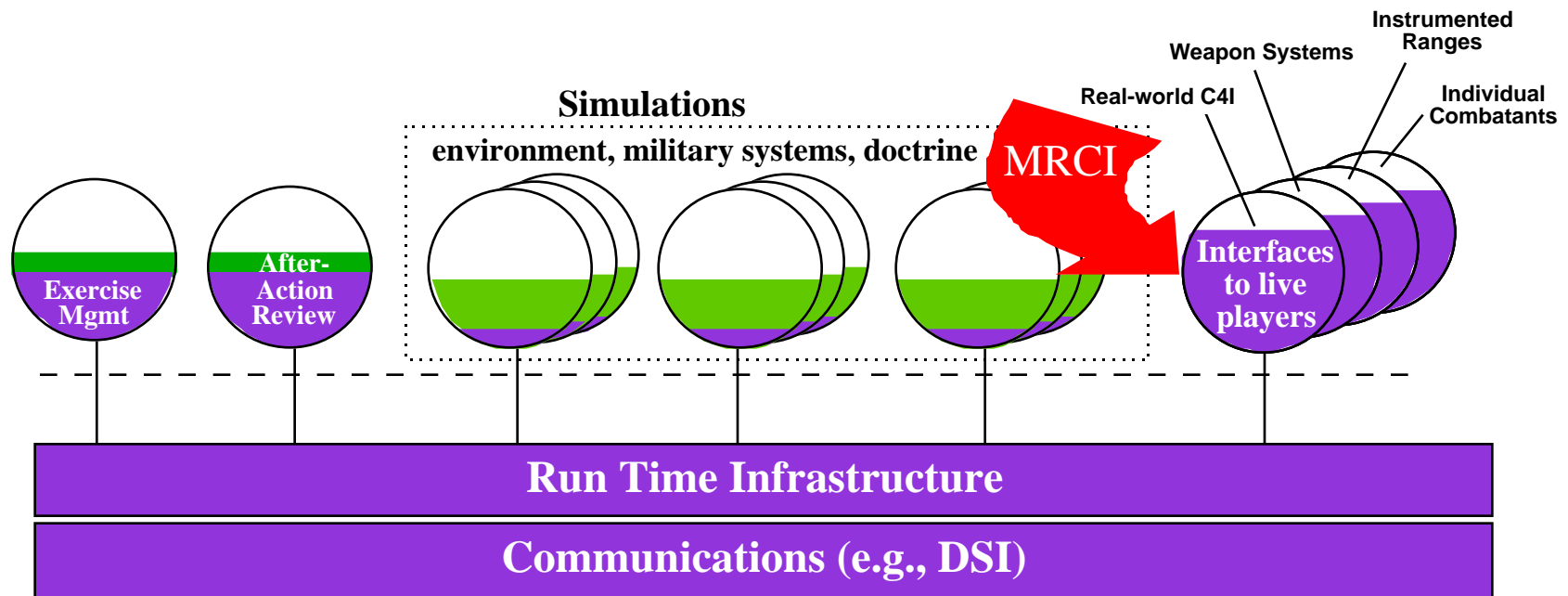
1130-1215 Lunch



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MRCI within HLA



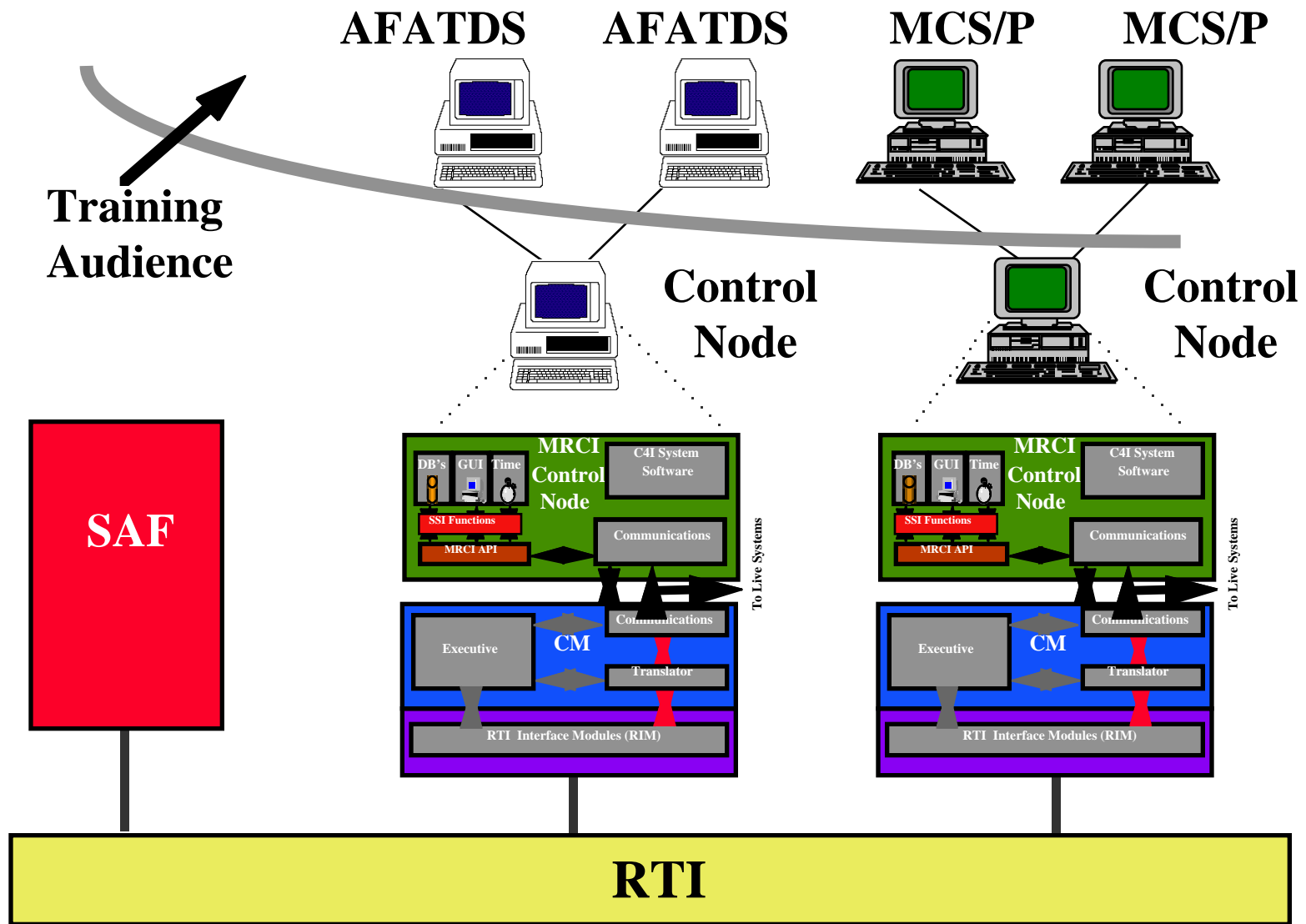
Key: reused across all DoD simulation systems
 reused across a simulation domain
 unique



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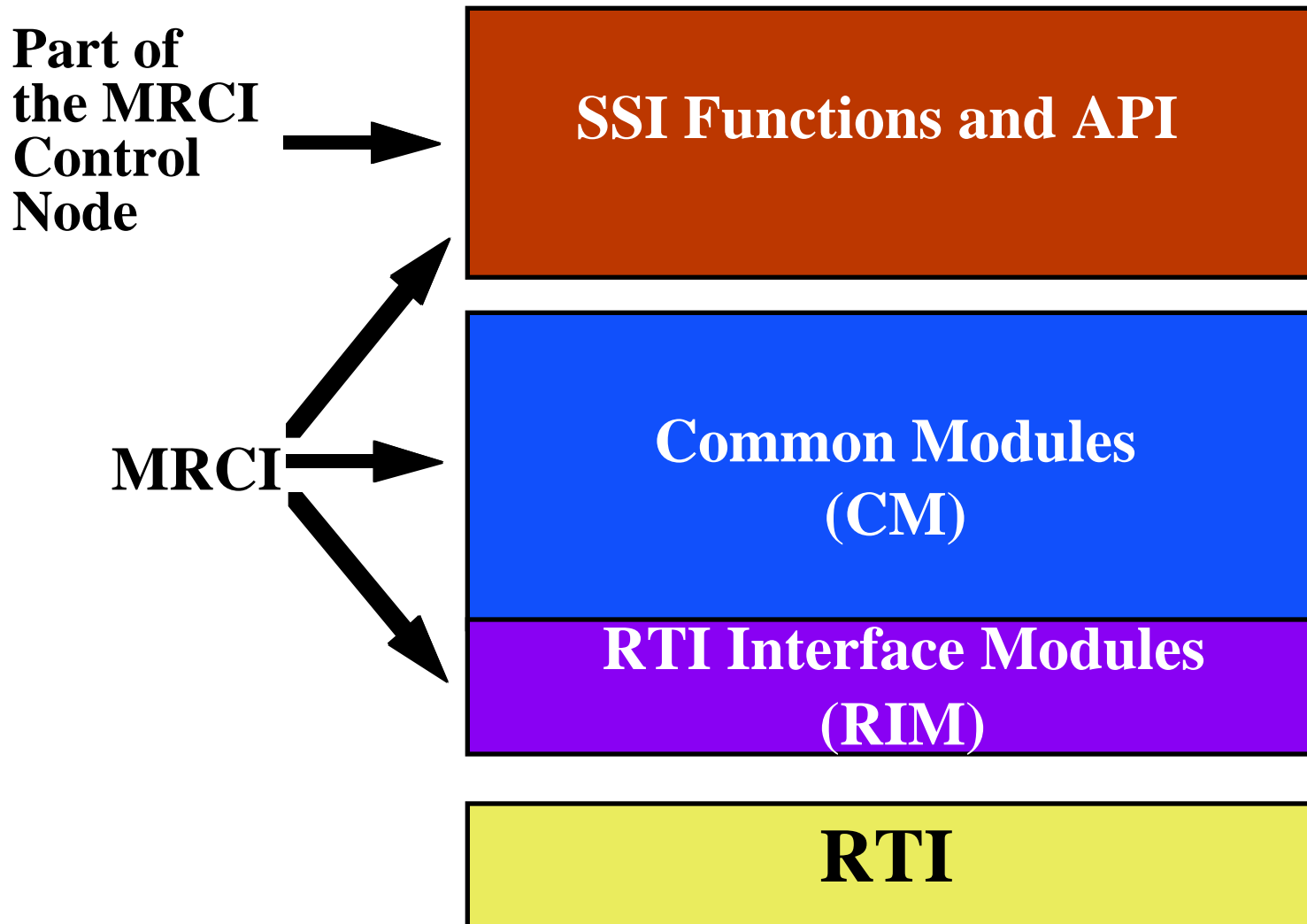
Representative Relationship Between the Training Audience and the MRCI



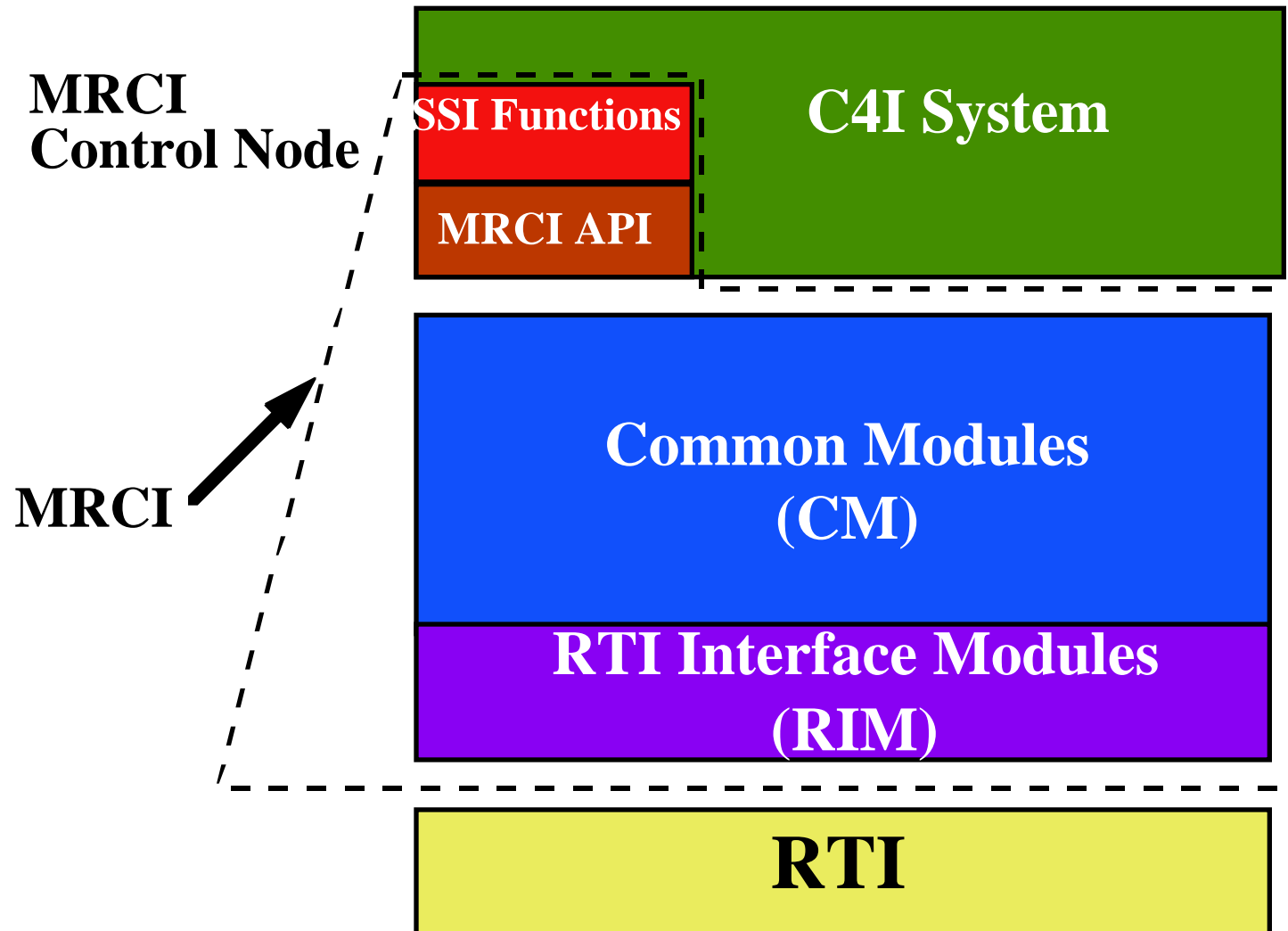
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MRCI Top Level Architecture (1 of 3)



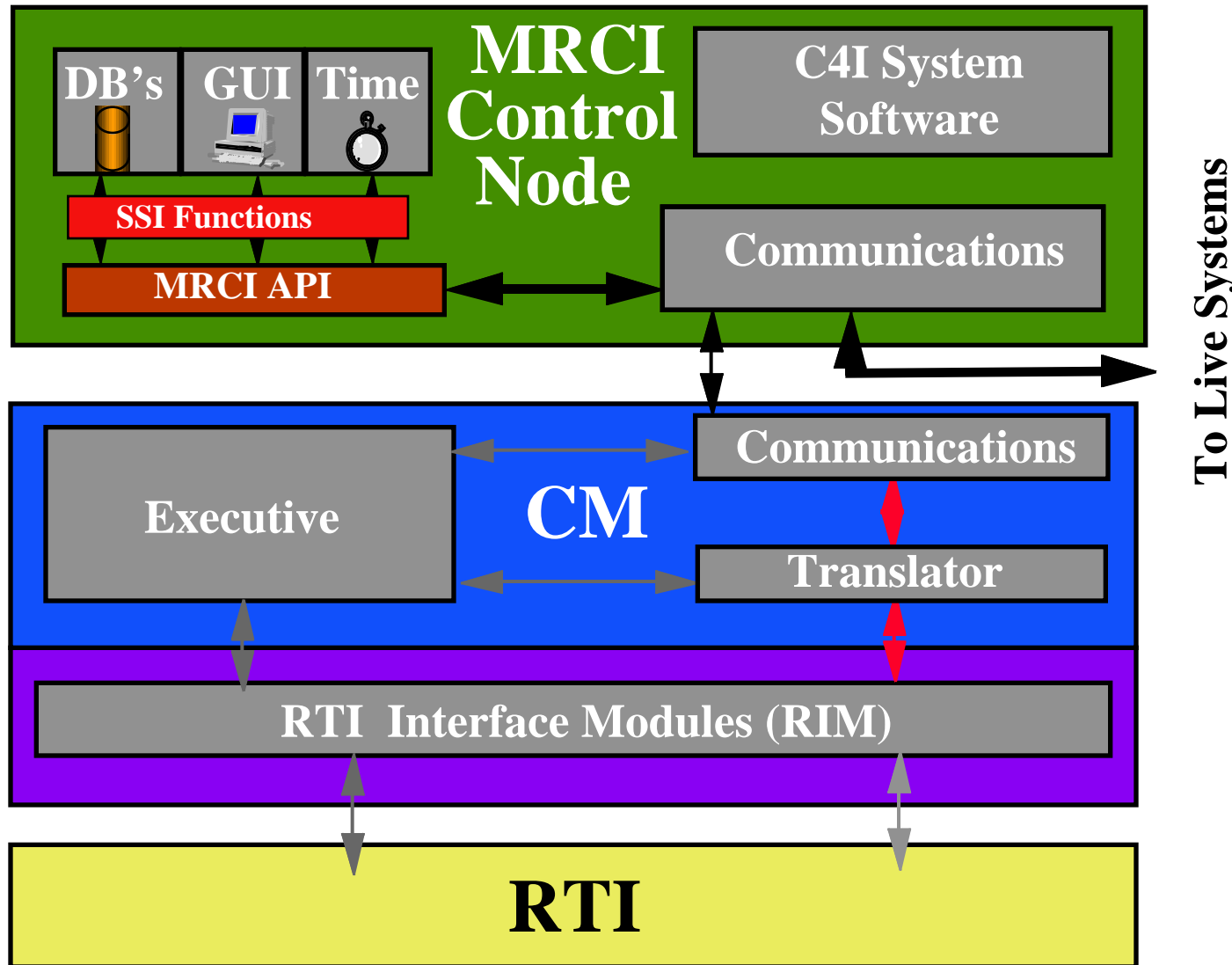
MRCI Top Level Architecture (2 of 3)



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MRCI Top Level Architecture (3 of 3)

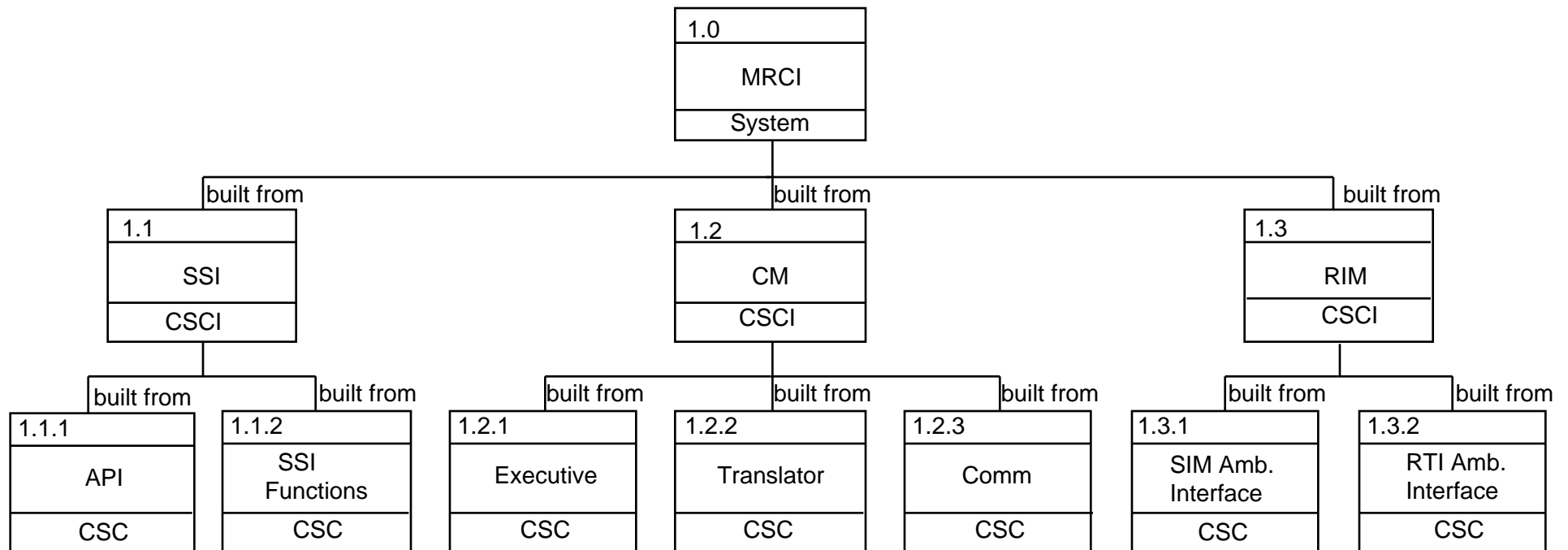


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MRCI Software Configuration Items and Components Hierarchy



MRCI CDR Agenda (1 of 2)

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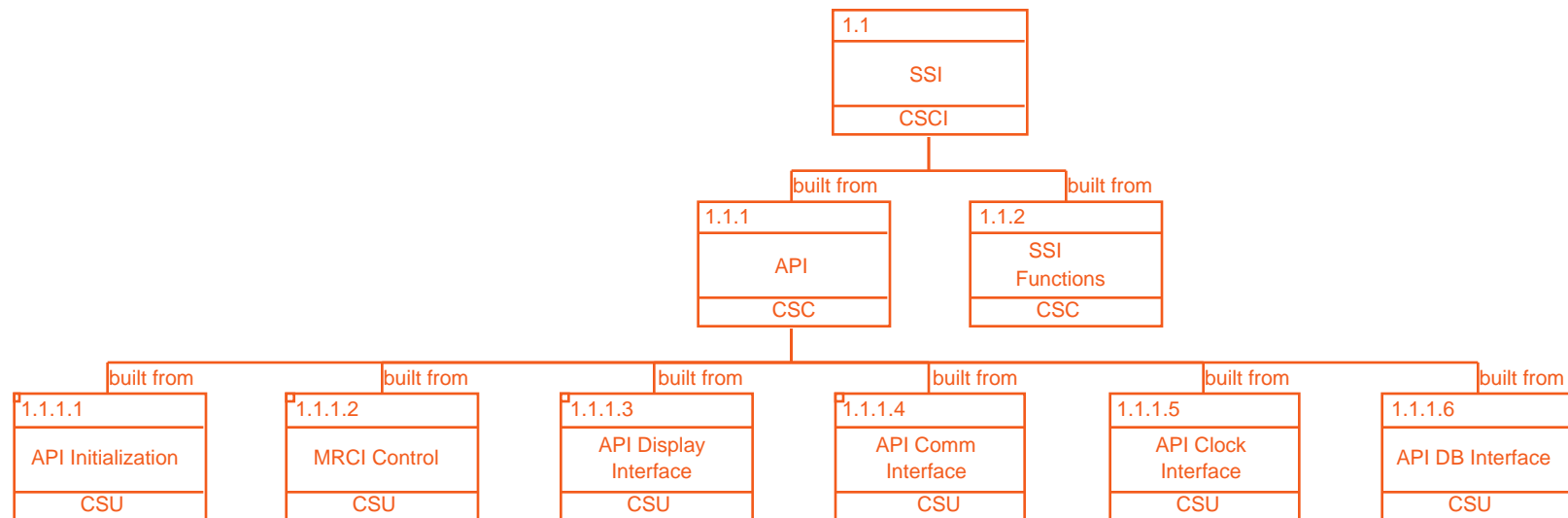
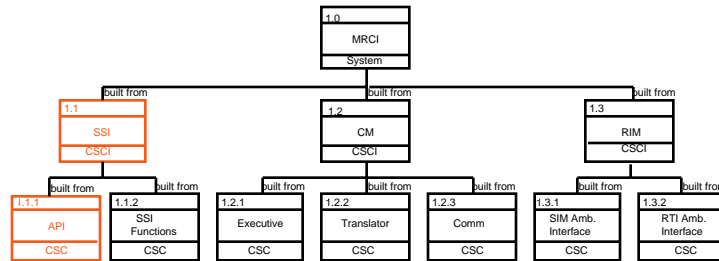


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An Employee-Owned Company

SSI Software Hierarchy (1 of 8)



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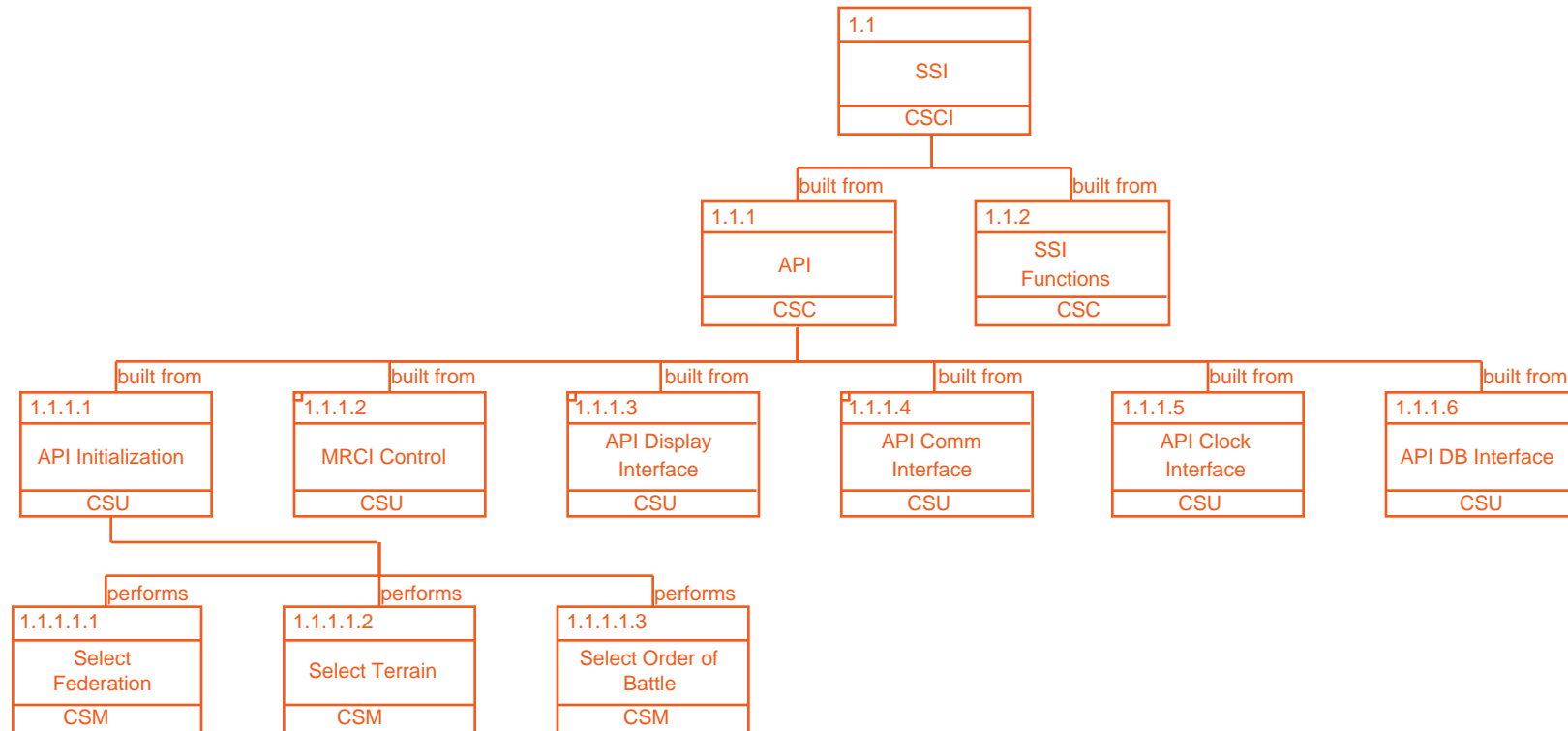
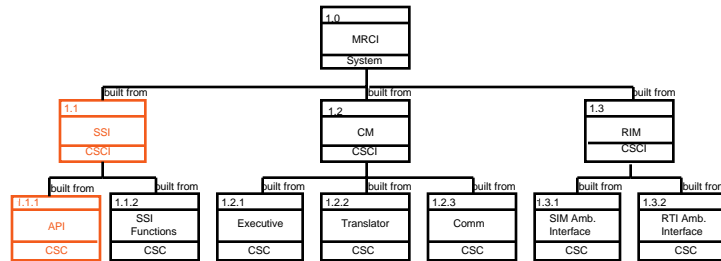
CSCI/CSC/CSU	Definition
SSI (1.1)	This allows the C4I system to access the Common Modules (1.2). The SSI is different for each C4I system, but every SSI is composed of the same type of components.
API (1.1.1)	This is a set of interface modules.
SSI Functions (1.1.2)	This module allows the C4I system functions to interact with the functions of the MRCI API.



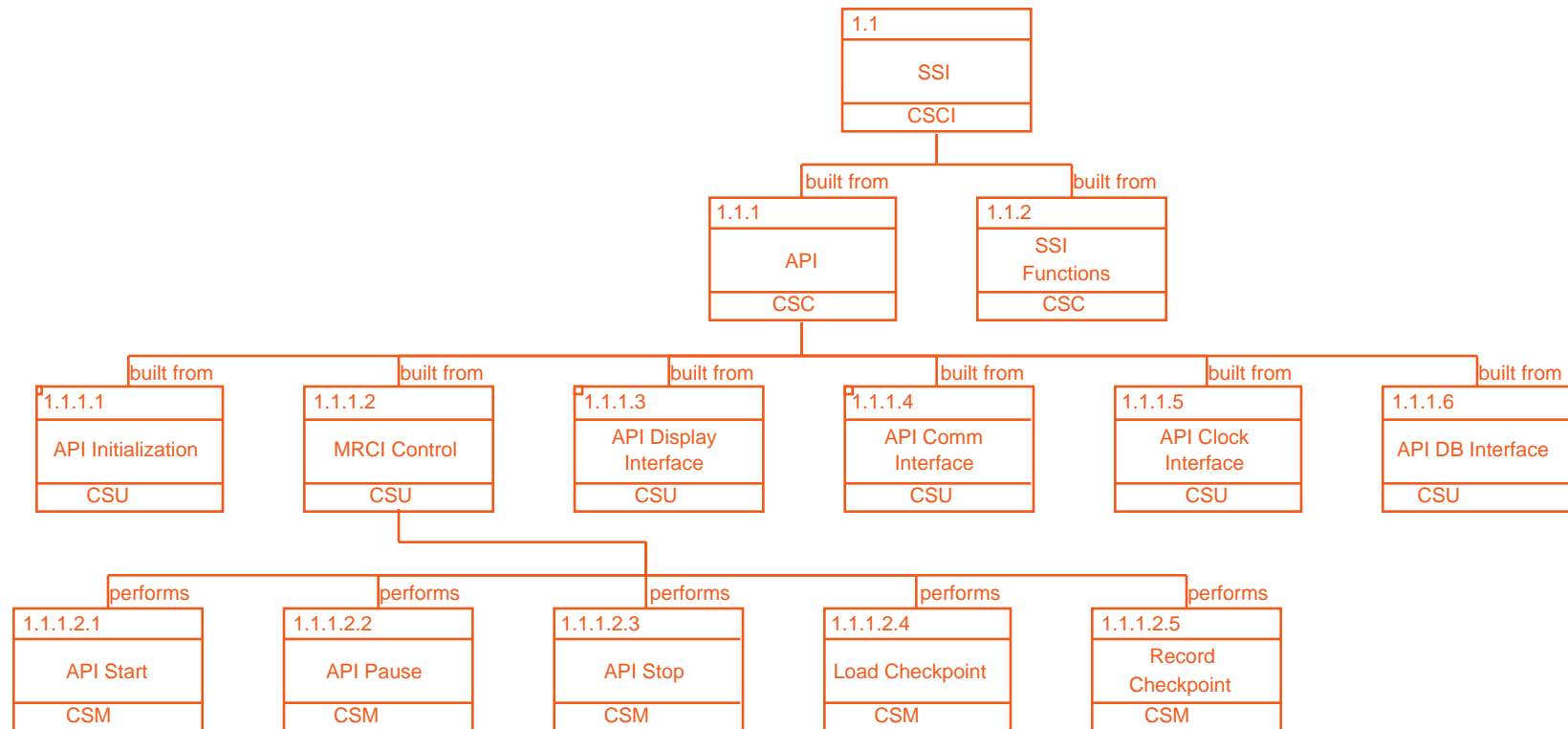
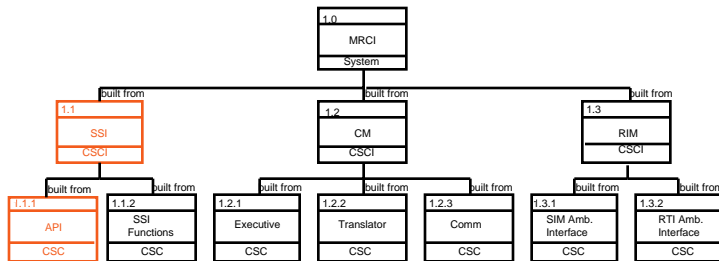
CSCI/CSC/CSU	Definition
API Initialization (1.1.1.1)	This module initializes the exercise by creating a federation, joining a federation, and identifying the terrain and the order of battle from the C4I GUI.
MRCI Control (1.1.1.2)	This allows the C4I Control Node operator to control the operation of the MRCI. This encompasses starting, pausing, and stopping the MRCI message passing and recording function.
API Display Interface (1.1.1.3)	This is responsible for labeling live and simulated data and updating the federation status, MRCI status, and State information.
API Comm Interface (1.1.1.4)	This module provides an interface to the C4I system's communications.
API Clock Interface (1.1.1.5)	This module maintains the synchronization of the C4I system time with the simulation/exercise time. This is accomplished by saving the current state of the exercise and restoring after pause or shutdown.
API DB Interface (1.1.1.6)	This module provides an interface to the C4I system Database.



SSI Software Hierarchy (2 of 8)



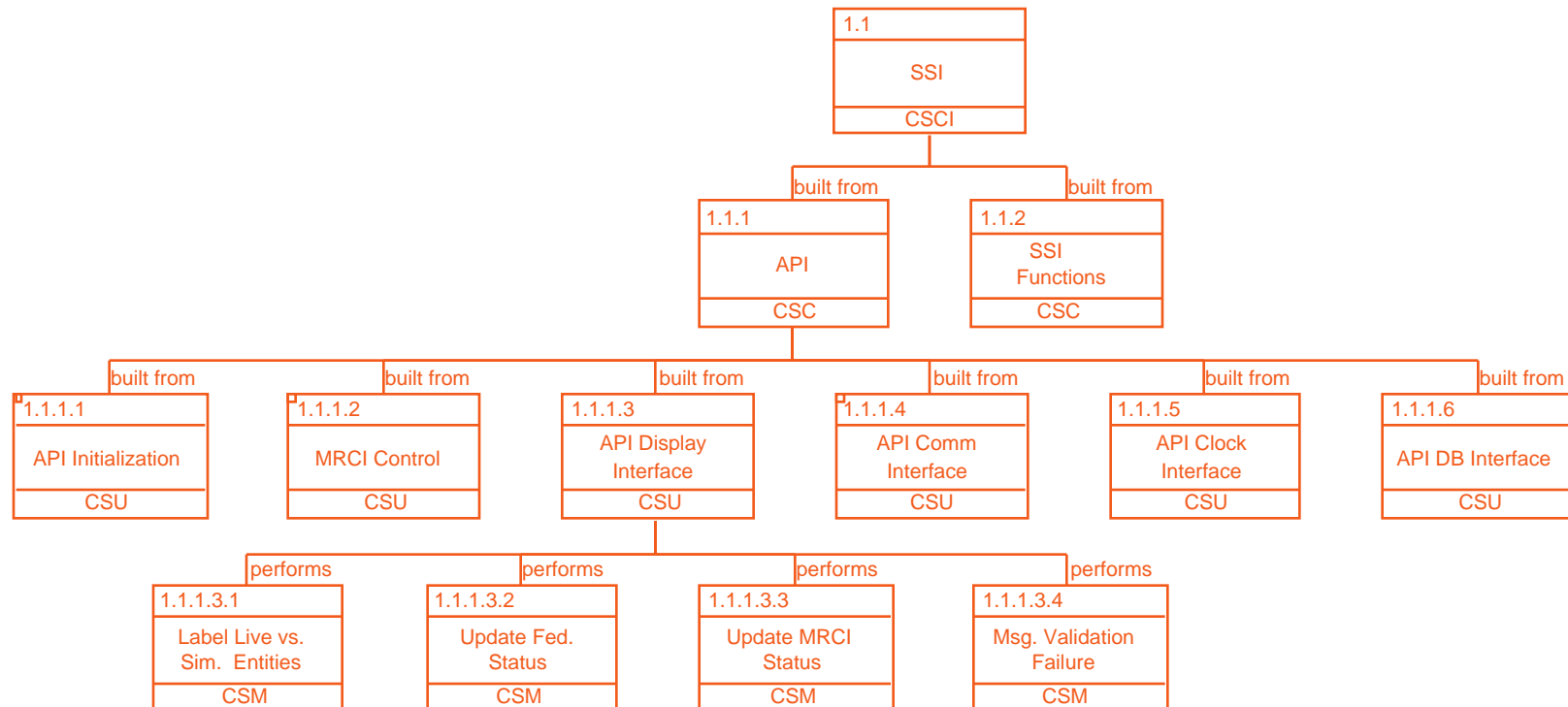
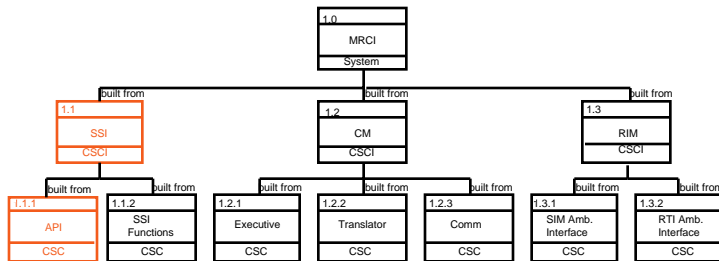
SSI Software Hierarchy (3 of 8)



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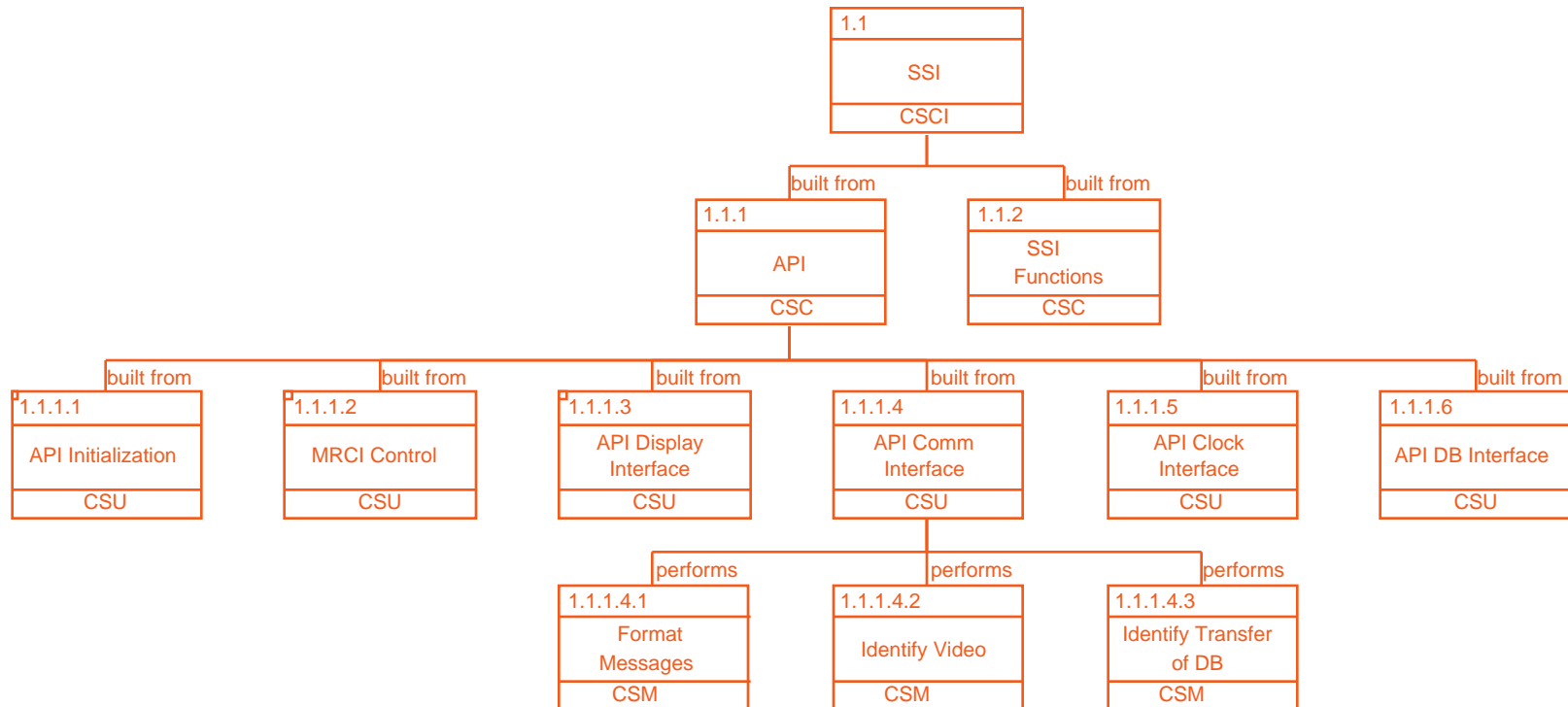
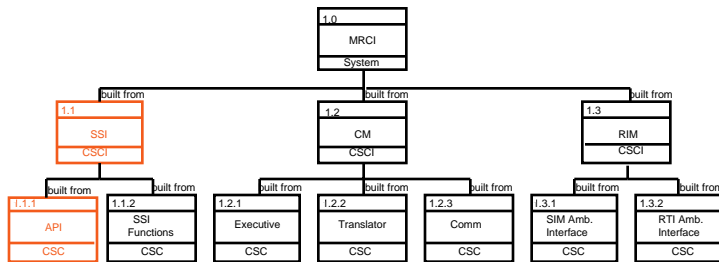
SSI Software Hierarchy (4 of 8)



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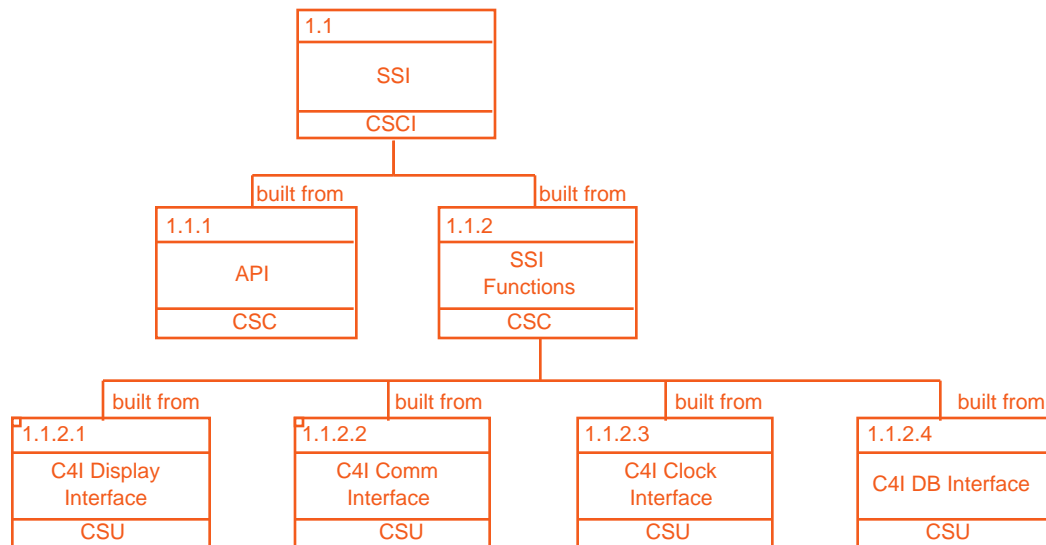
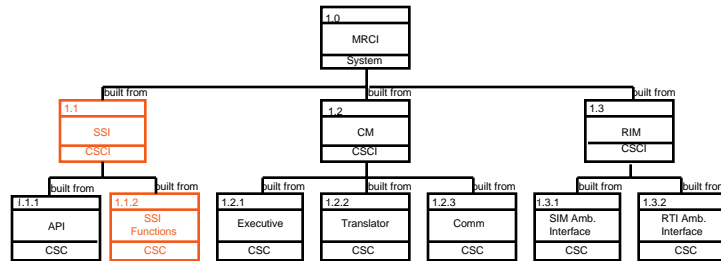
SSI Software Hierarchy (5 of 8)



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SSI Software Hierarchy (6 of 8)



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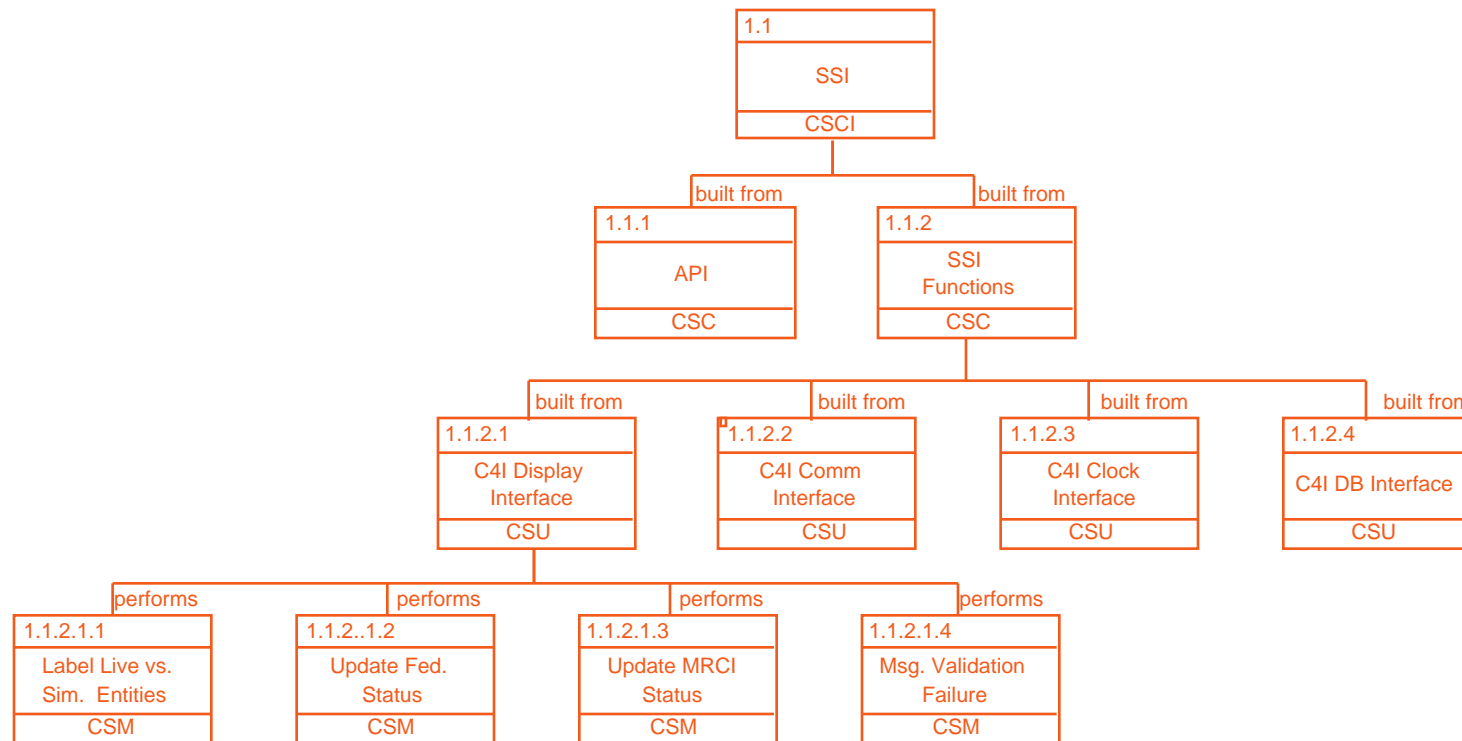
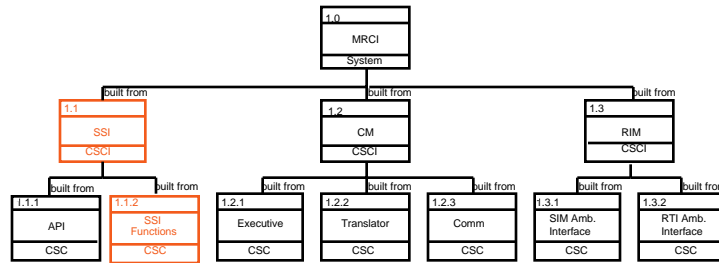
CSCI/CSC/CSU	Definition
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API (1.1.1)	This is a set of interface modules.
SSI Functions (1.1.2)	This module allows the C4I system functions to interact with the functions of the MRCI API.



CSCI/CSC/CSU	Definition
C4I Display Interface (1.1.2.1)	This C4I function is responsible for labeling live and simulated data and updating the federation status, MRCI status, and State information.
C4I Comm Interface (1.1.2.2)	This C4I function provides an interface to the C4I system's communications.
C4I Clock Interface (1.1.2.3)	This C4I function maintains the synchronization of the C4I system time with the simulation/exercise time. This is accomplished by saving the current state of the exercise and restoring after pause or shutdown.
C4I DB Interface (1.1.2.4)	This C4I function provides an interface to the C4I system Database.



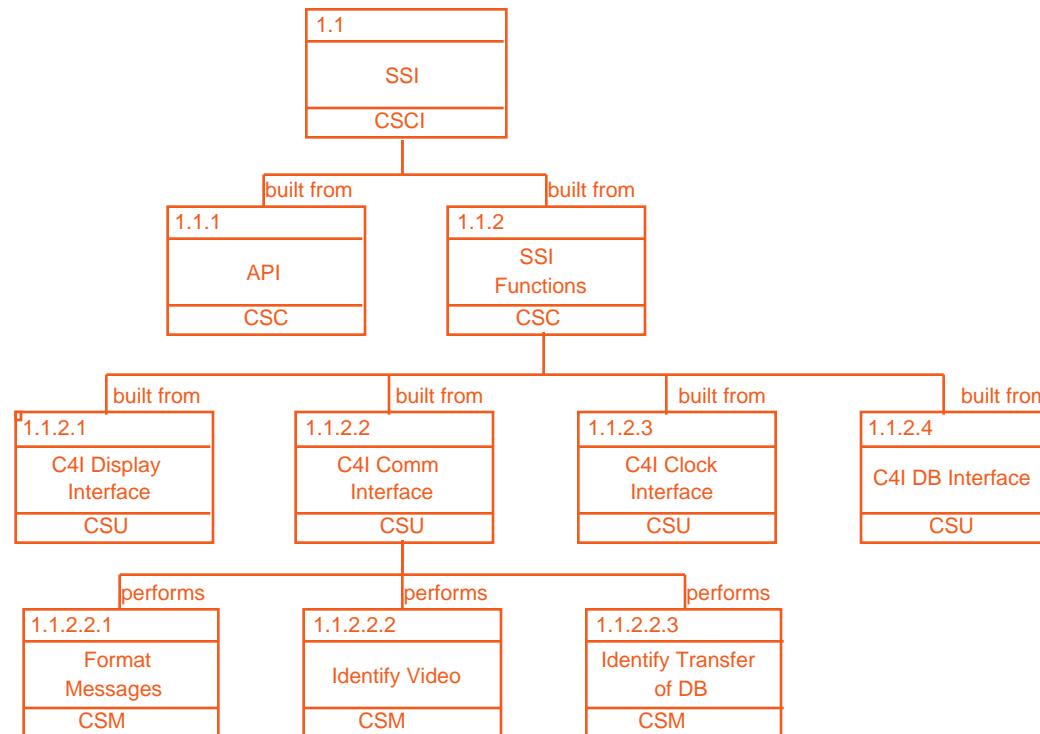
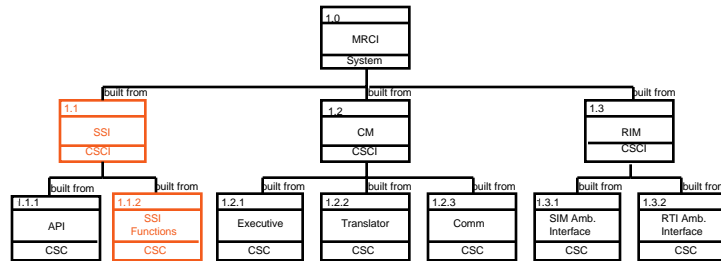
SSI Software Hierarchy (7 of 8)



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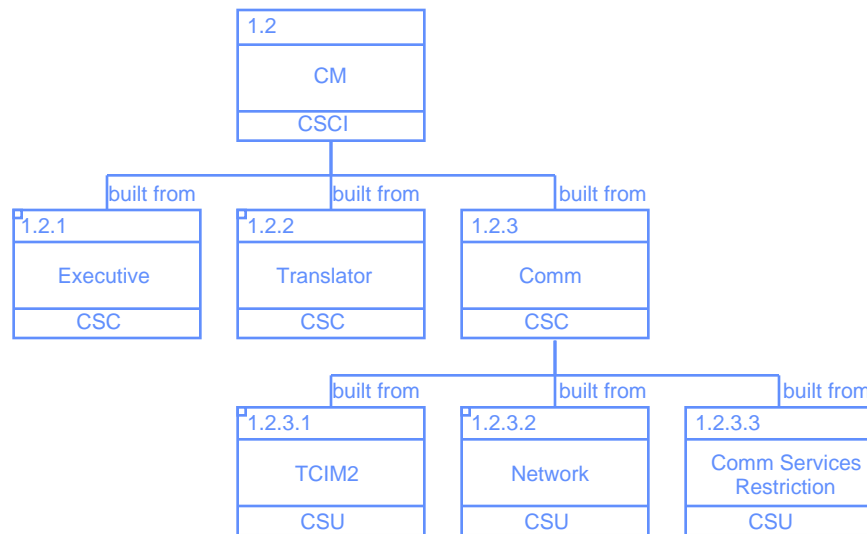
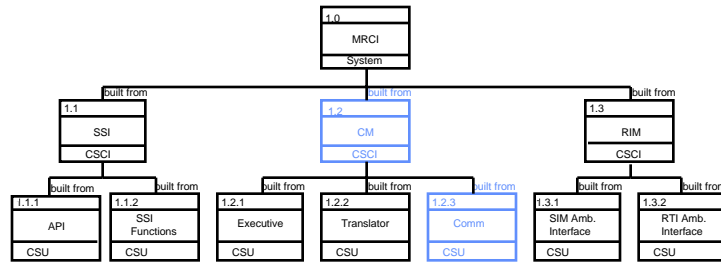
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CM Software Hierarchy (1 of 41)



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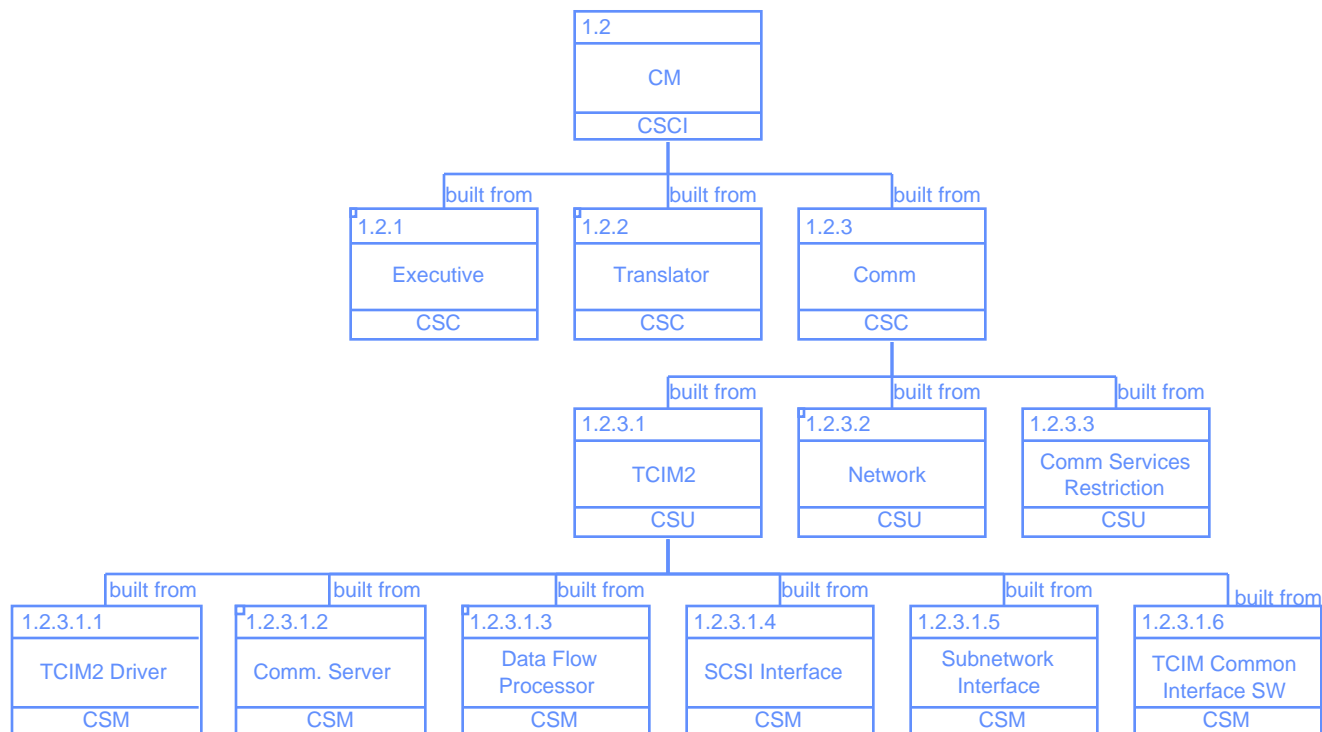
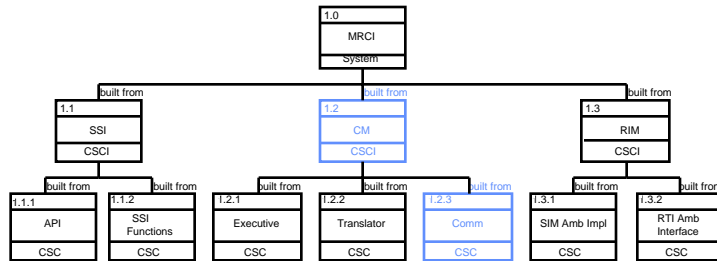
CSCI/CSC/CSU	Definition
CM (1.2)	The Common Modules allow the C4I system to interface with the simulation world by converting messages between the normal, operational C4I message formats and CCSIL.
Executive (1.2.1)	This module is responsible for initializing the MRCI, routing messages, recording activity, monitoring the system, and managing objects and time.
Translator (1.2.2)	This module translates messages between the C4I message formats and CCSIL.
Communications (1.2.3)	This is a set of modules that performs the communications between the C4I and the MRCI.



CSCI/CSC/CSU	Definition
TCIM2 (1.2.3.1)	The TCIM2 functions as a communications emulator for the MRCI
Network (1.2.3.2)	This module establishes the system as a node on the network.
CSR (1.2.3.3)	This module applies communication effects to messages being sent to the C4I system.



CM Software Hierarchy (2 of 41)



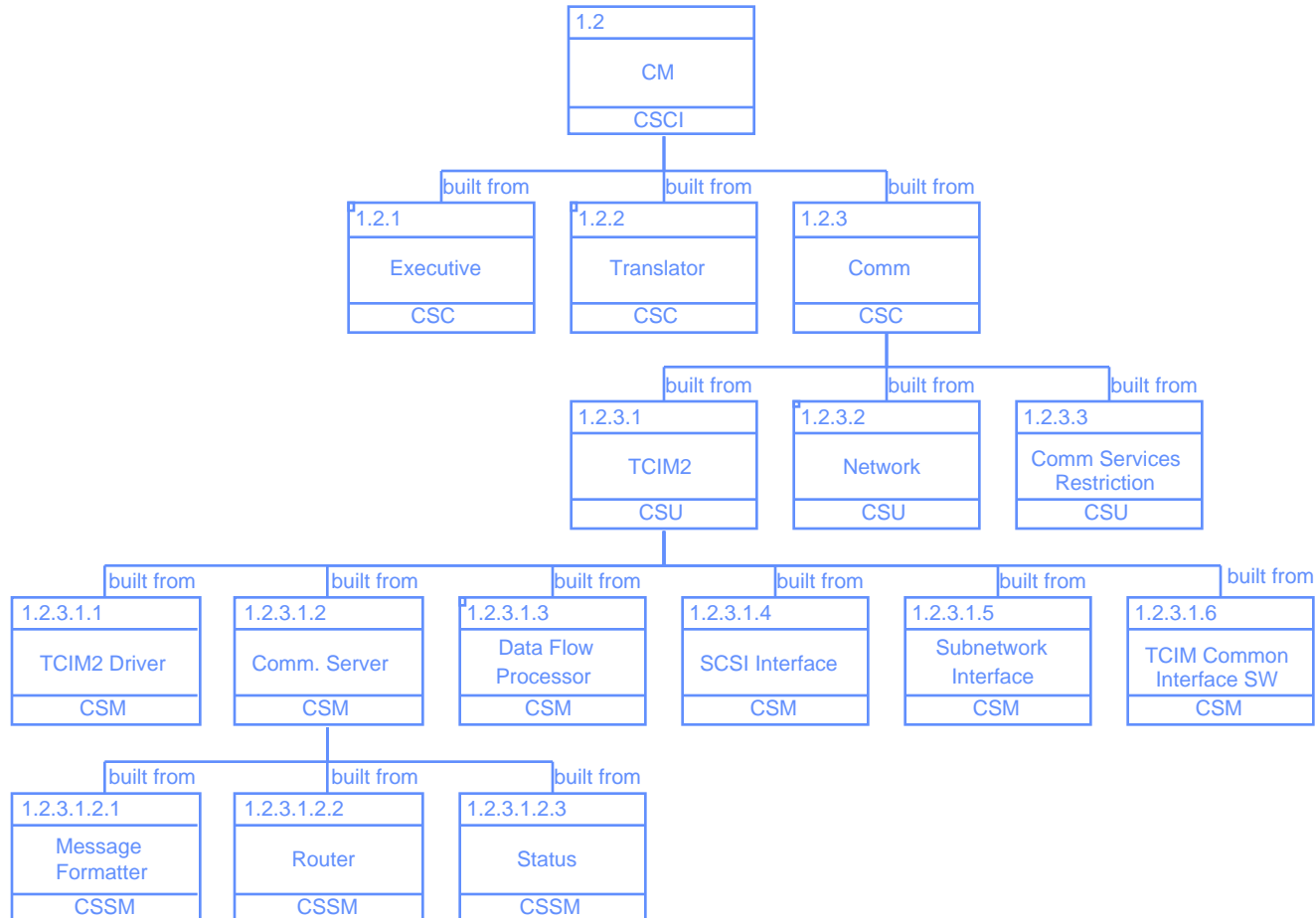
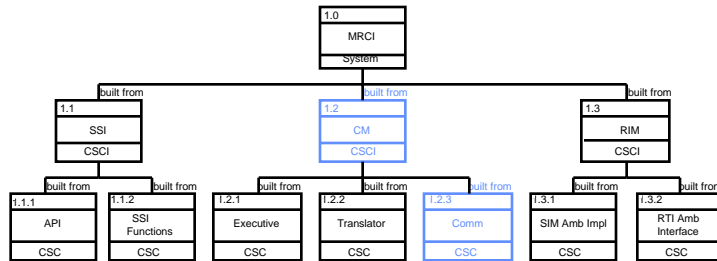
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Modules/ Sub-Modules	Definition
TCIM2 Driver (1.2.3.1.1)	This module establishes the parameters required to connect the TCIM2 hardware to a specific machine.
Communications Server (1.2.3.1.2)	The CS handles the message formatting and routing of messages for the TCIM2.
Data Flow Processor (1.2.3.1.3)	This module establishes a path for protocols which will not enter the TCIS.
SCSI Interface (1.2.3.1.4)	This module makes the physical connection between the system and the TCIM2 software.
Subnetwork Interface (1.2.3.1.5)	This module configures the X.25 and 188-220 packet to interface with the TCP/IP stack.
TCIS (1.2.3.1.6)	This module is the interface software for all TCIM-supported protocols except JVMF/188-220 and X.25.



CM Software Hierarchy (3 of 41)



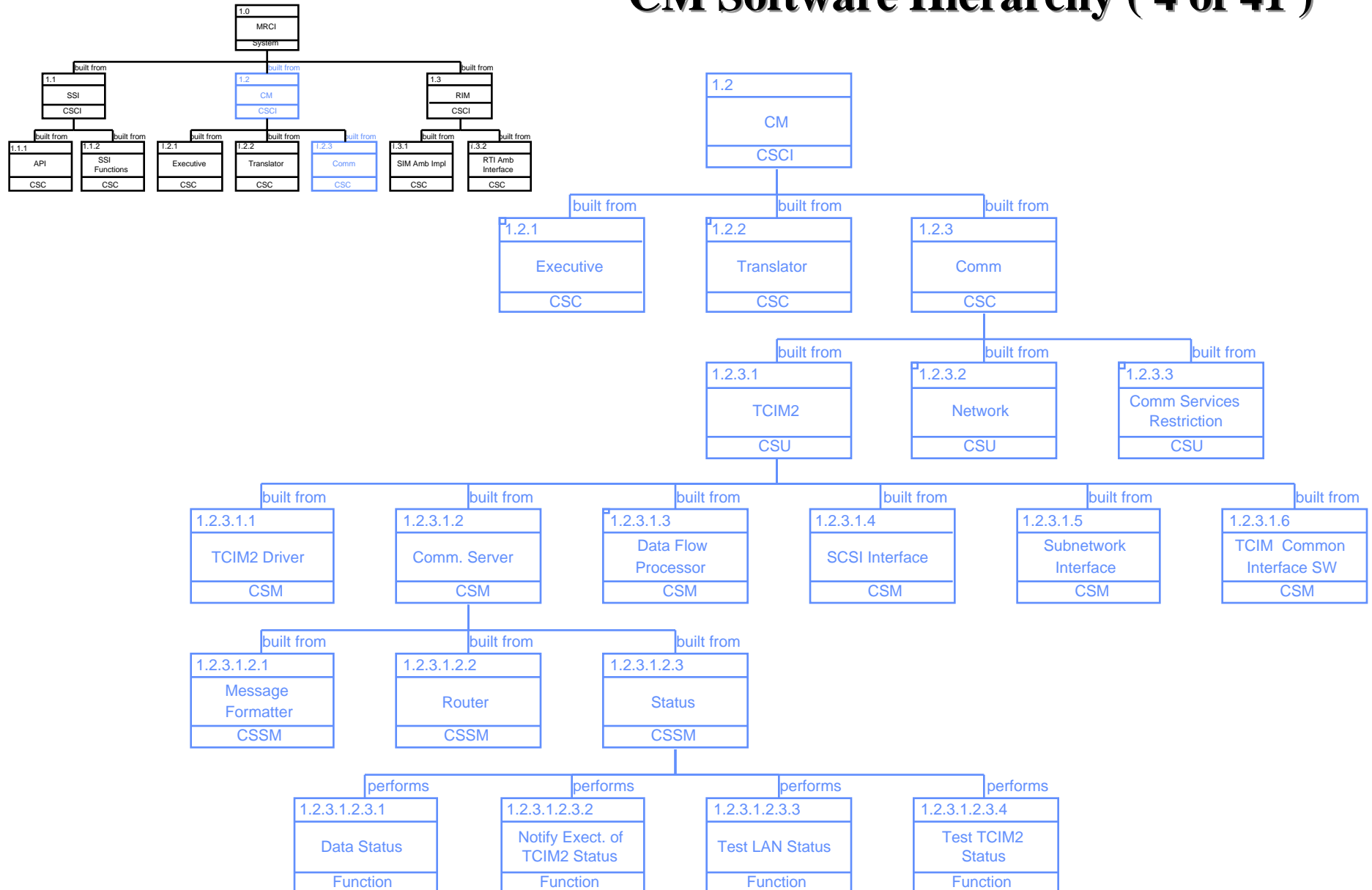
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Modules/ Sub-Modules	Definition
Message Formatter (1.2.3.1.2.1)	This module places the new message into a data format compatible with the hardware and link.
Router (1.2.3.1.2.2)	This module determines the primary path for the messages and a secondary path.
Status (1.2.3.1.2.3)	The status module passes the states of the system or data to the executive module.



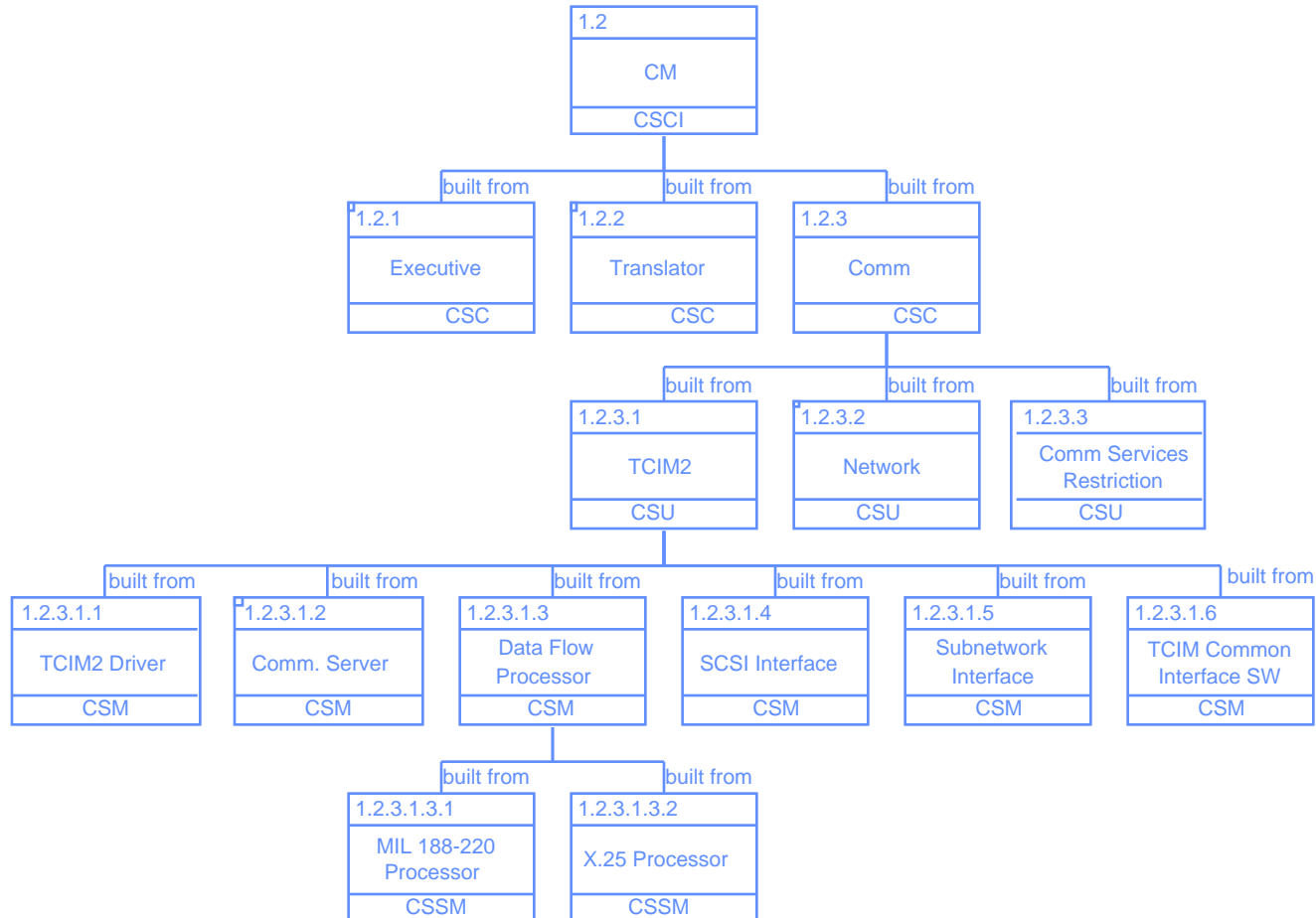
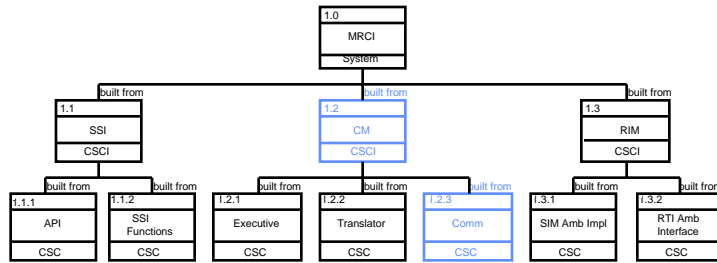
CM Software Hierarchy (4 of 41)



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CM Software Hierarchy (5 of 41)



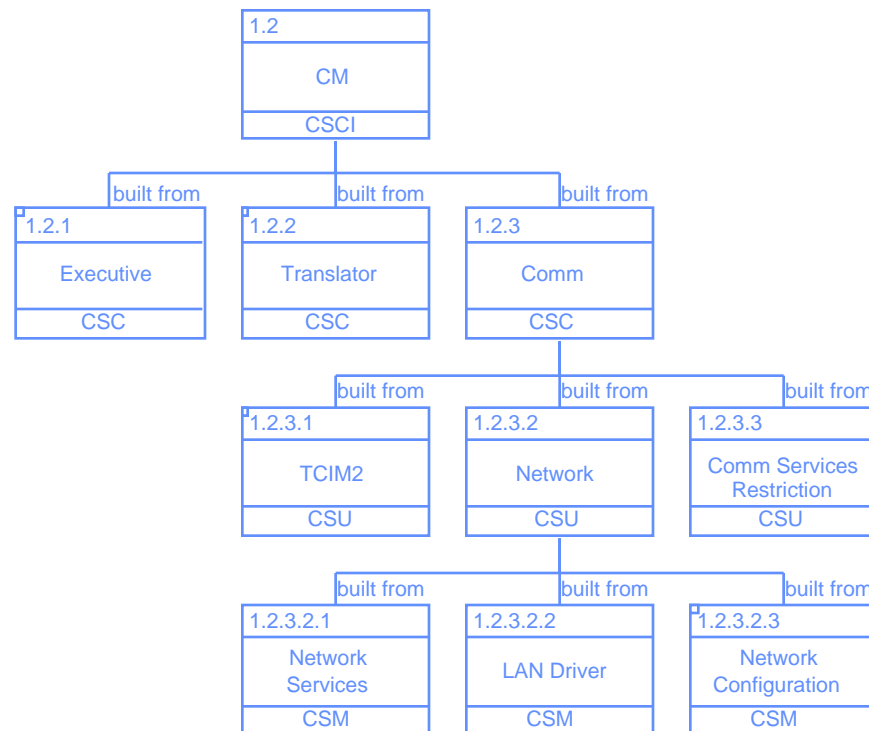
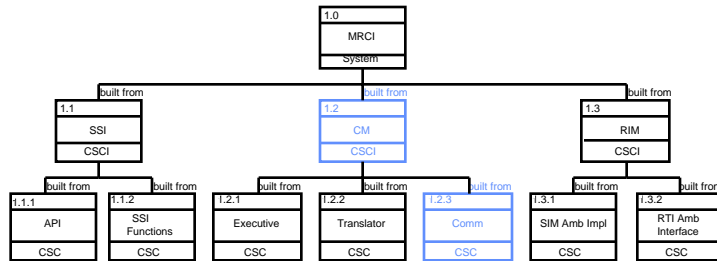
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Modules/ Sub-Modules	Definition
MIL 188-220 (1.2.3.1.3.1)	This module processes the Mil 188-220 data packet and passes the information to the Subnetwork Interface.
X.25 Processor (1.2.3.1.3.2)	This module processes the X.25 data packet and passes the information to the Subnetwork Interface.



CM Software Hierarchy (6 of 41)



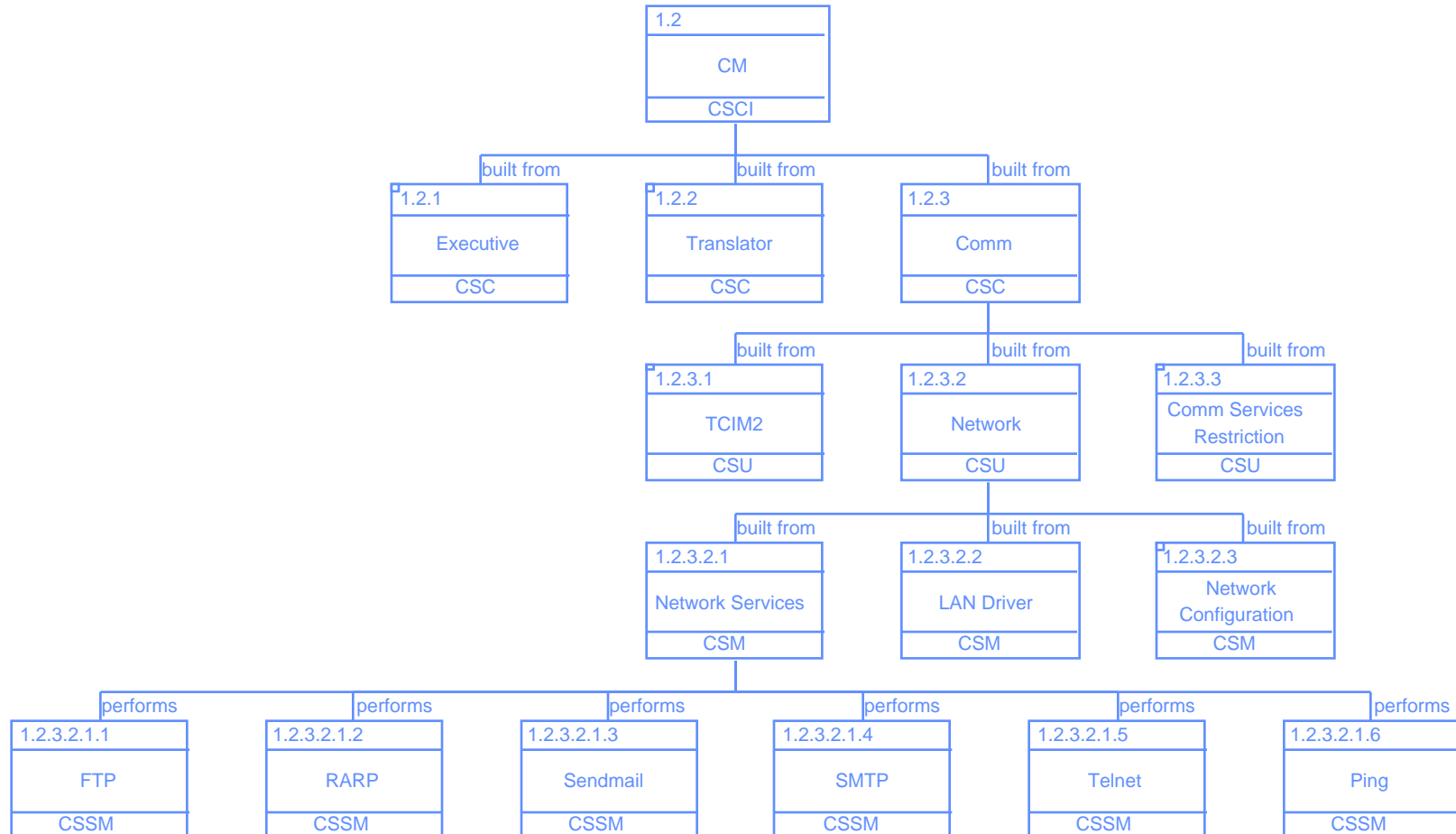
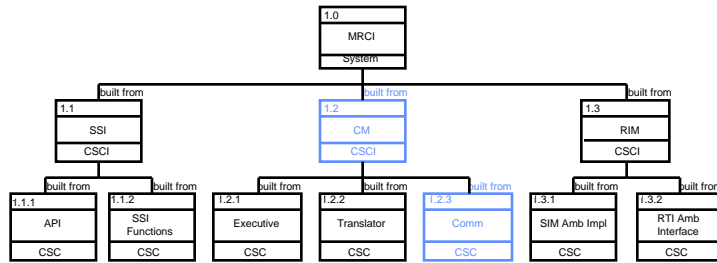
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Modules/ Sub-Modules	Definition
Network Services (1.2.3.2.1)	The Network Services Module establishes remote transfers and communication checks.
LAN Driver (1.2.3.2.2)	This module enables the system to communicate to other host systems over the local network.
Network Configuration (1.2.3.2.3)	This module provides network setup on the C4I and MRCI hardware



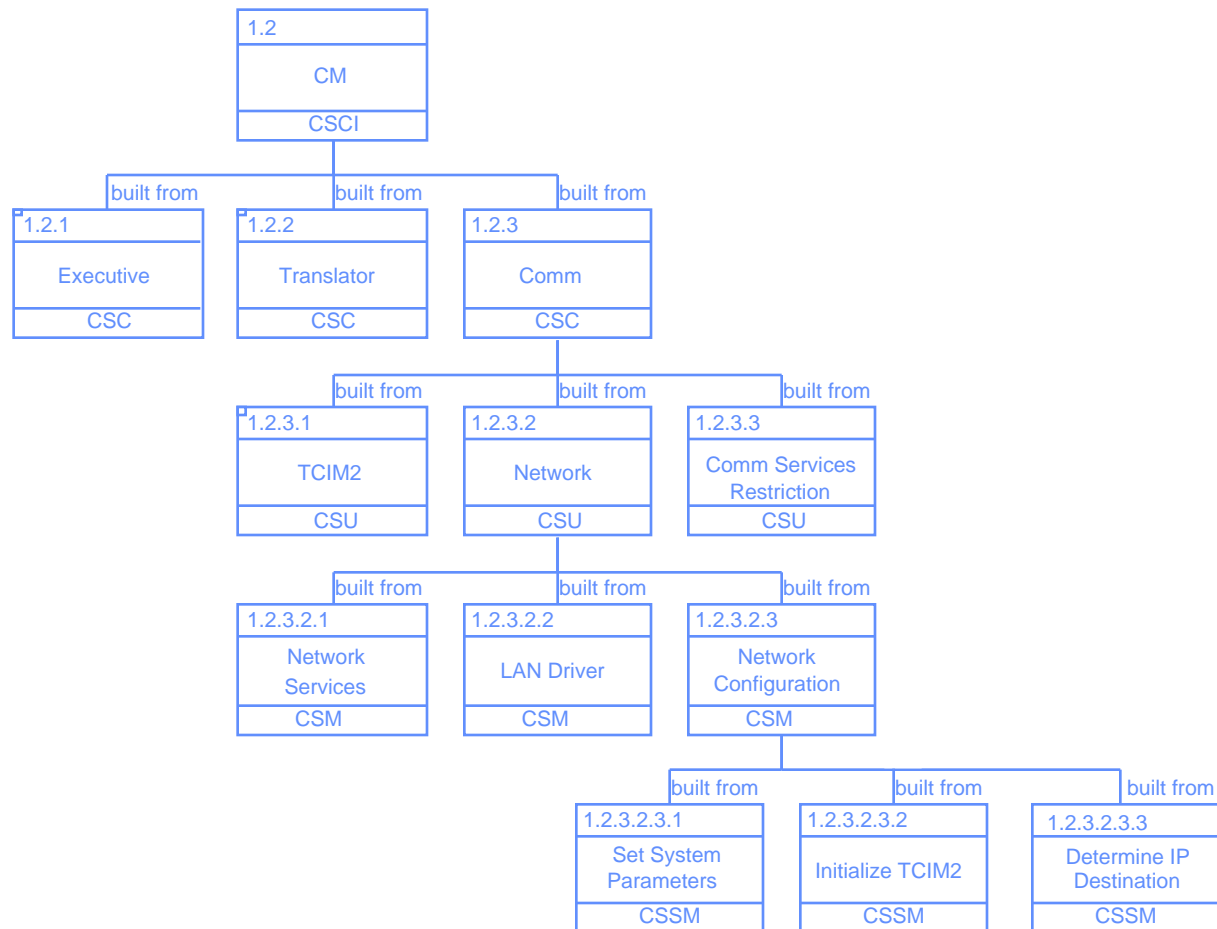
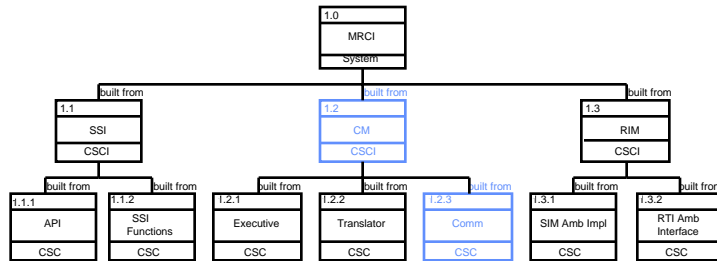
CM Software Hierarchy (7 of 41)



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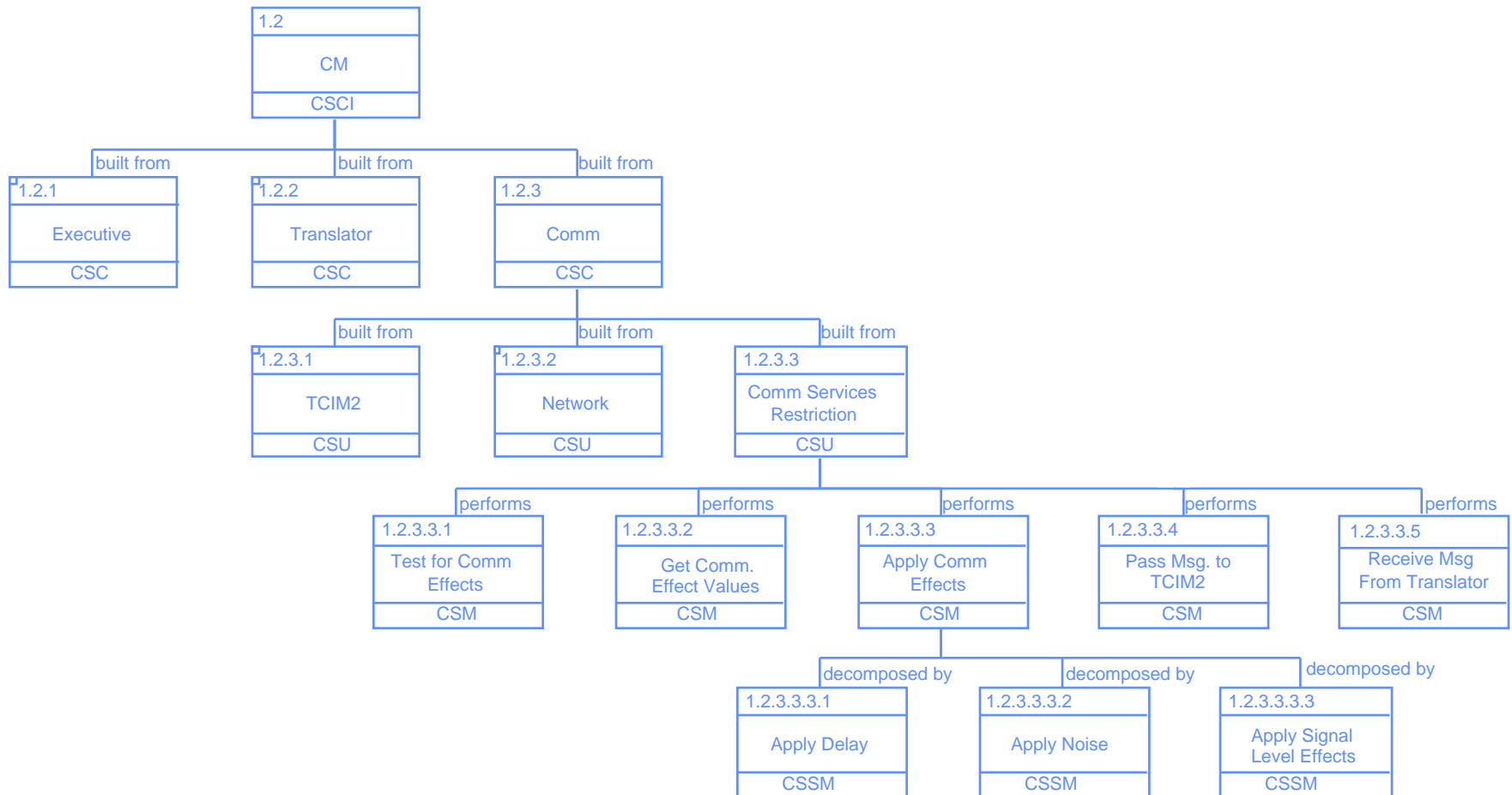
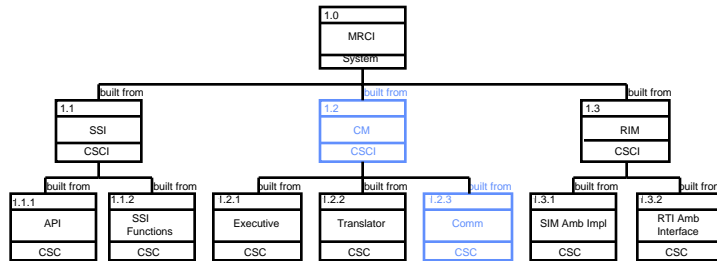
CM Software Hierarchy (8 of 41)



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CM Software Hierarchy (9 of 41)



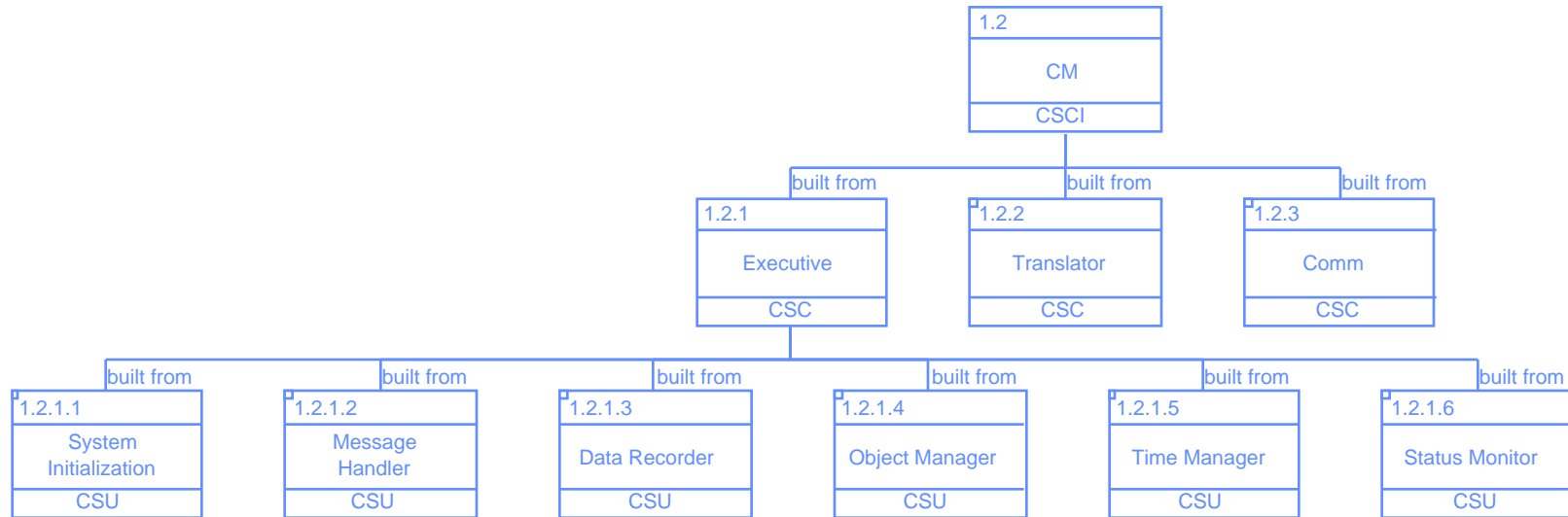
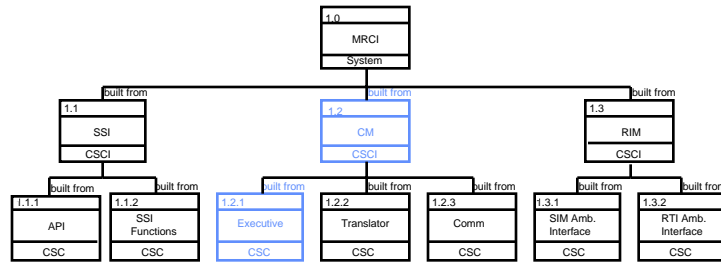
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Modules/ Sub-Modules	Definition
Test for Comm Effects (1.2.3.3.1)	This module checks for the presence of any communication effects.
Get Comm Effects (1.2.3.3.2)	This module gets the necessary communication effect to perform degradation.
Apply Comm Effects (1.2.3.3.3)	This module applies the communication effect.
Pass Msg. to TCIM2 (1.2.3.3.4)	This module passes the message to the TCIM2.



CM Software Hierarchy (10 of 41)



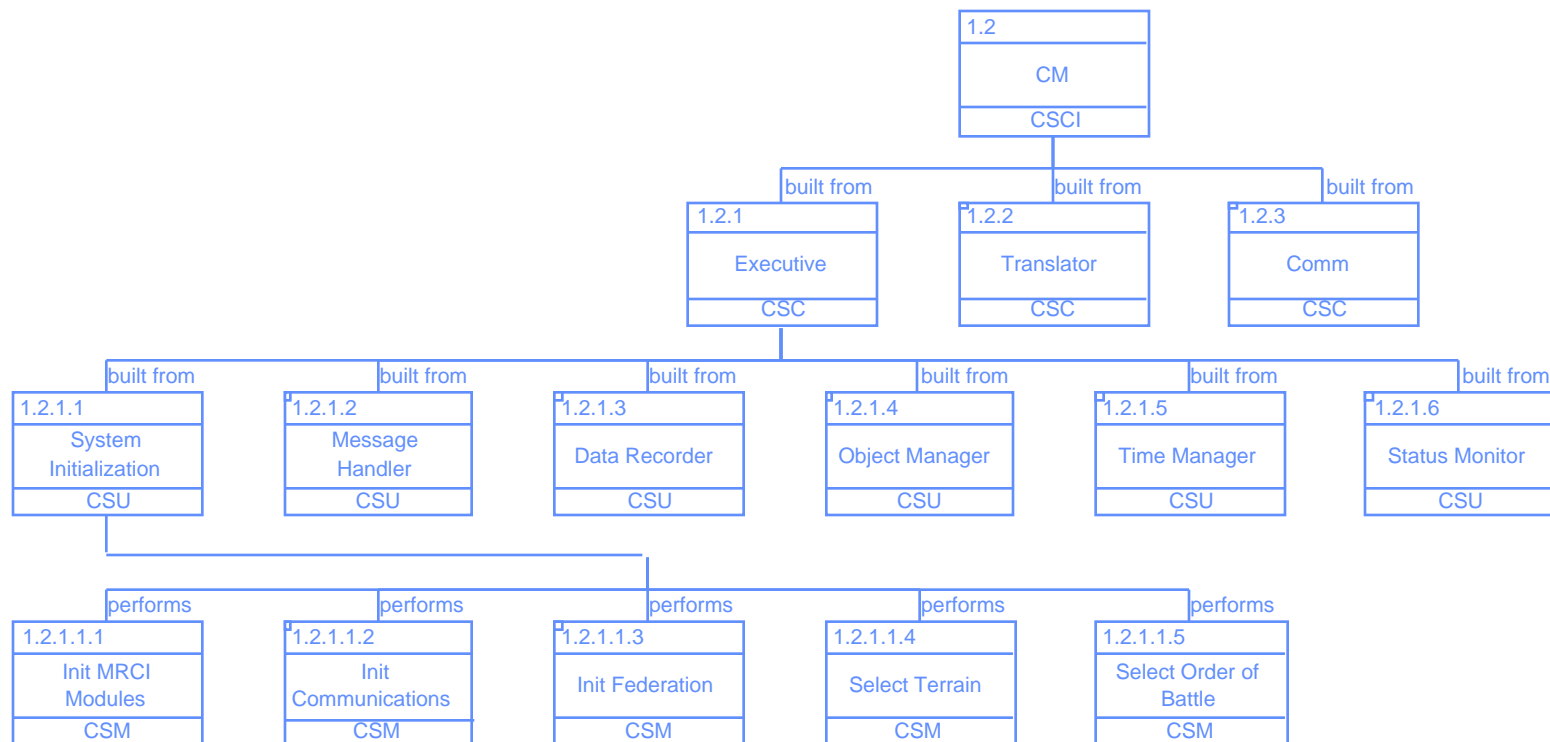
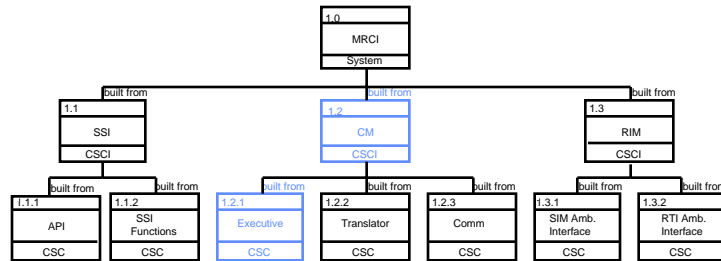
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CSCI/CSC/CSU	Definition
System Initialization (1.2.1.1)	This initializes the MRCI modules to the proper configuration depending upon the interfacing C4I system.
Message Handler (1.2.1.2)	This component is responsible for message routing from the Communications Modules.
Data Recorder (1.2.1.3)	This component records all activity (message traffic, system status, etc.).
Object Manager (1.2.1.4)	This is responsible for managing all parameters related to objects.
Time Manager (1.2.1.5)	This component is responsible for time management in the MRCI.
Status Monitor (1.2.1.6)	This component monitors the federation and shows the federates.



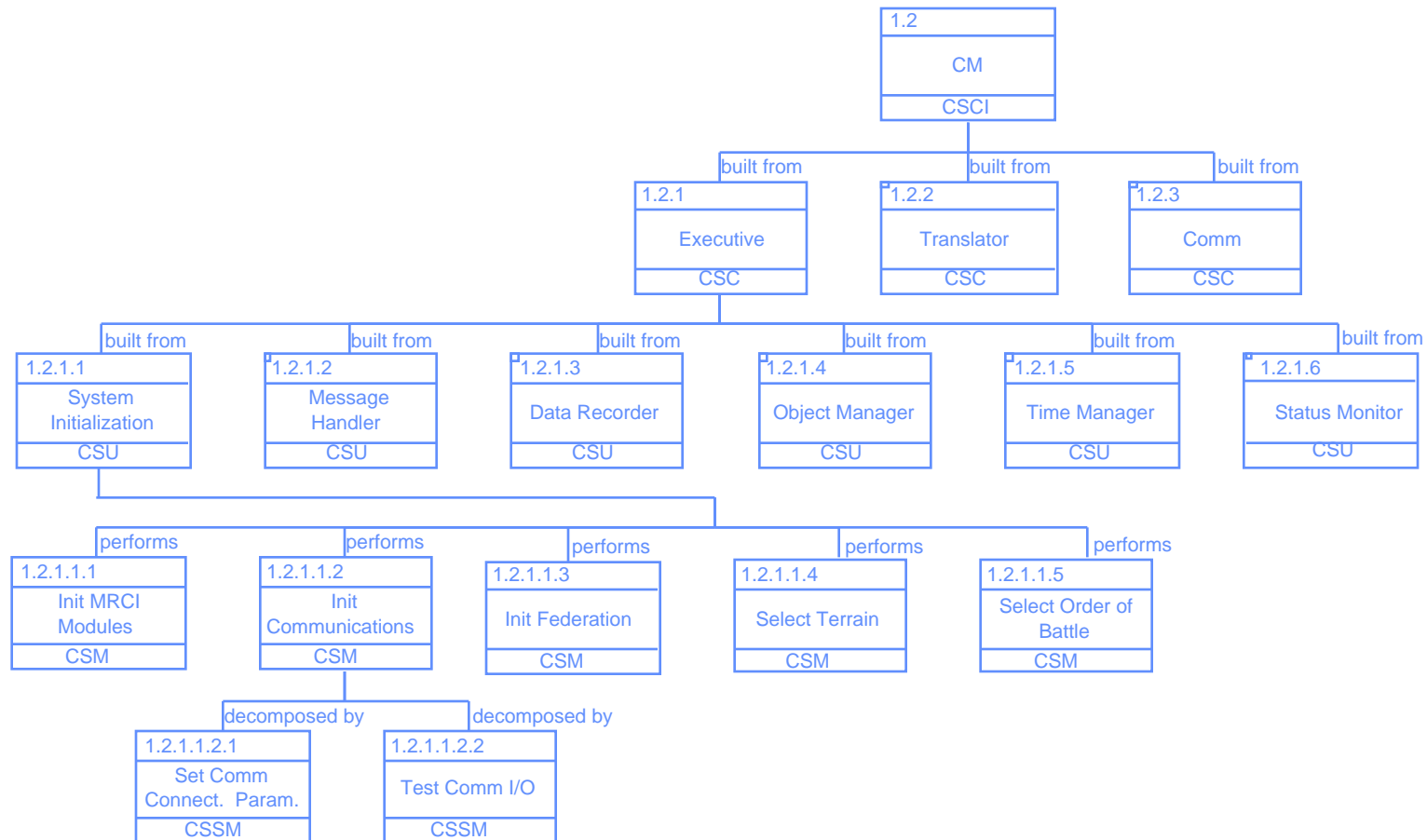
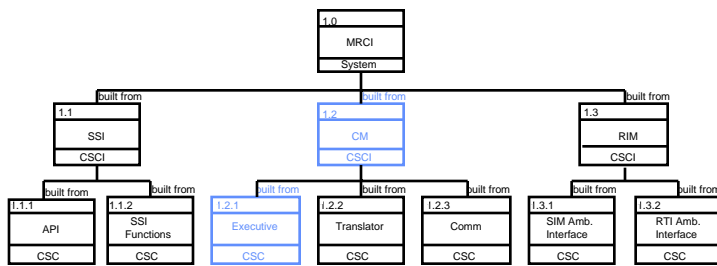
CM Software Hierarchy (11 of 41)



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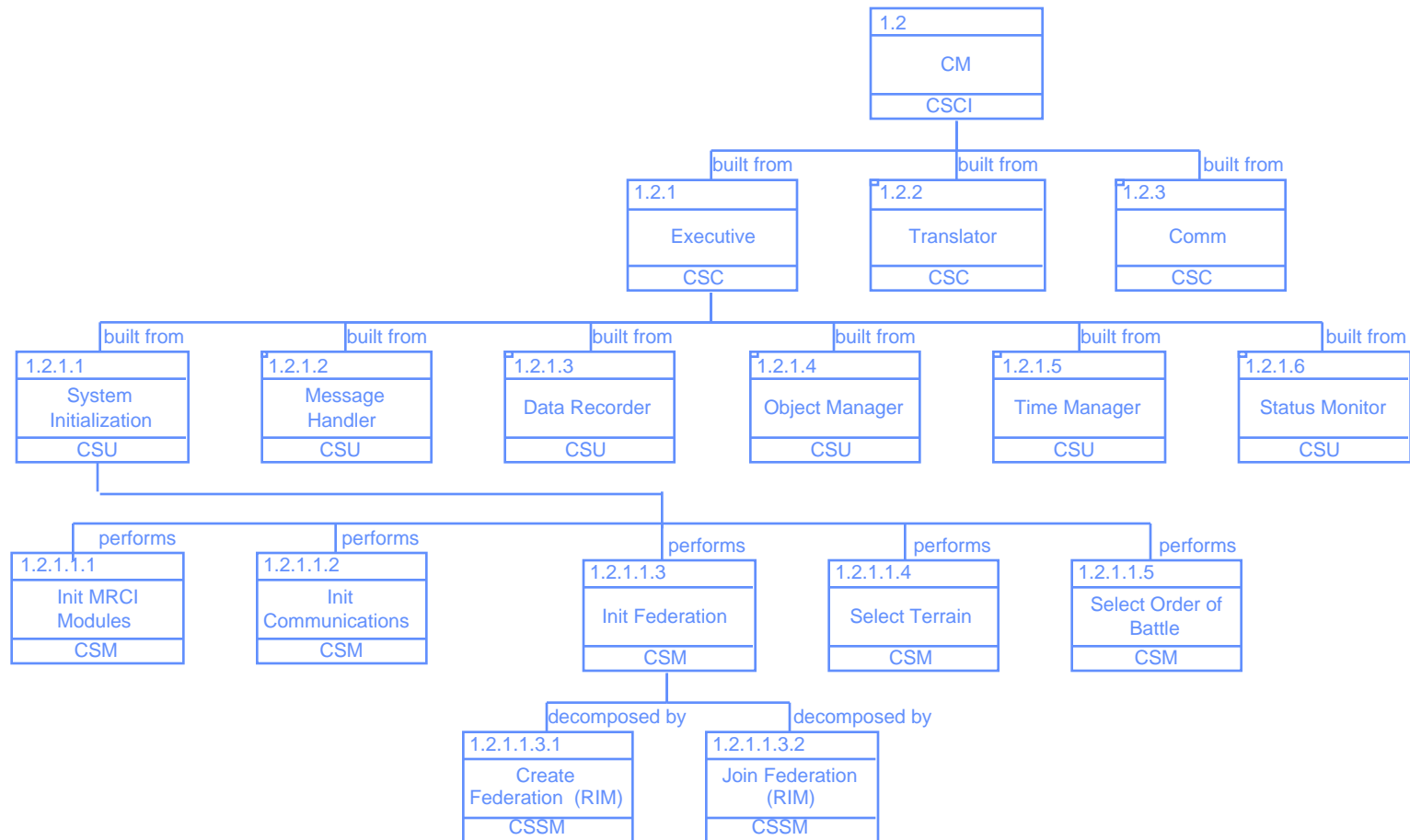
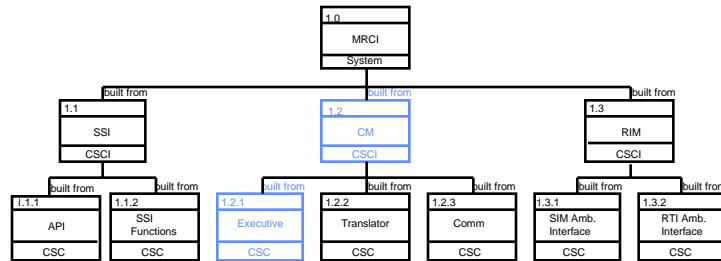
CM Software Hierarchy (12 of 41)



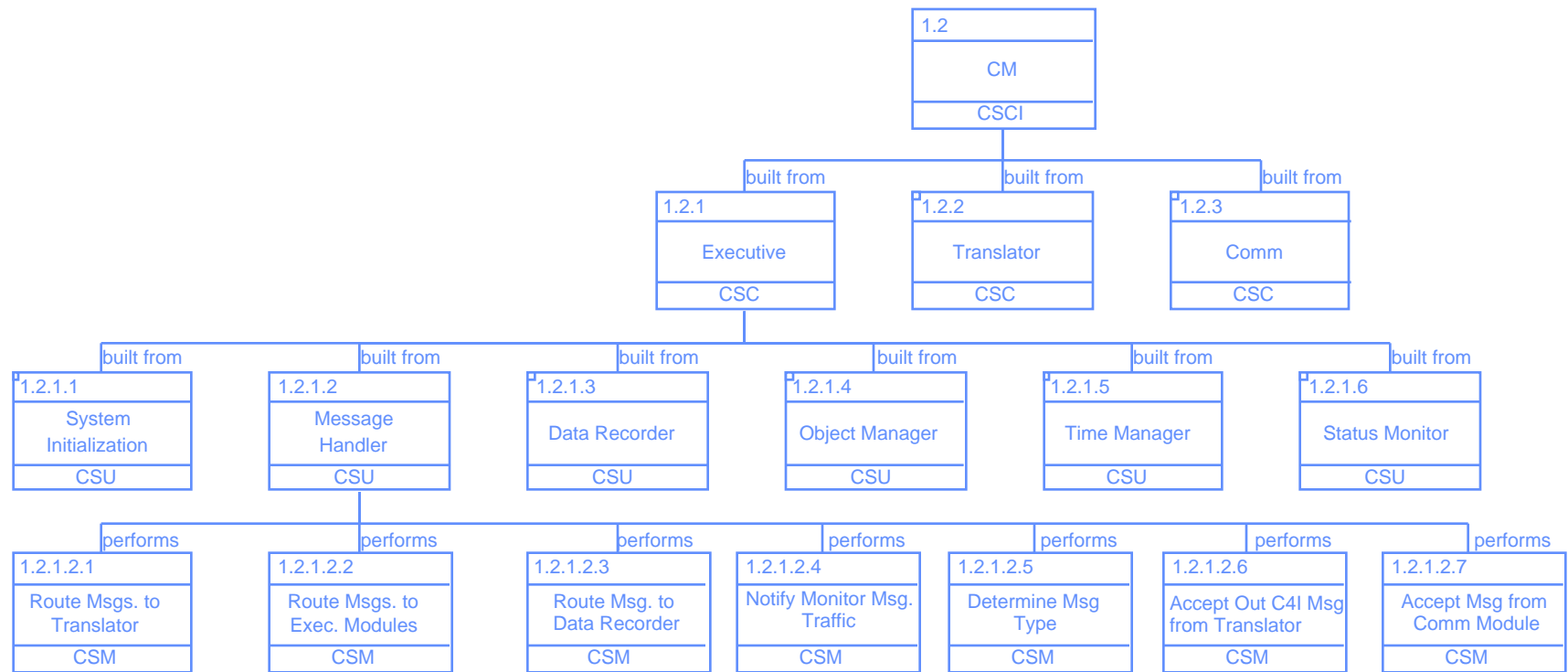
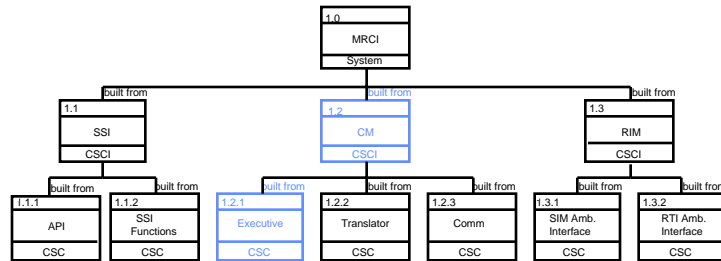
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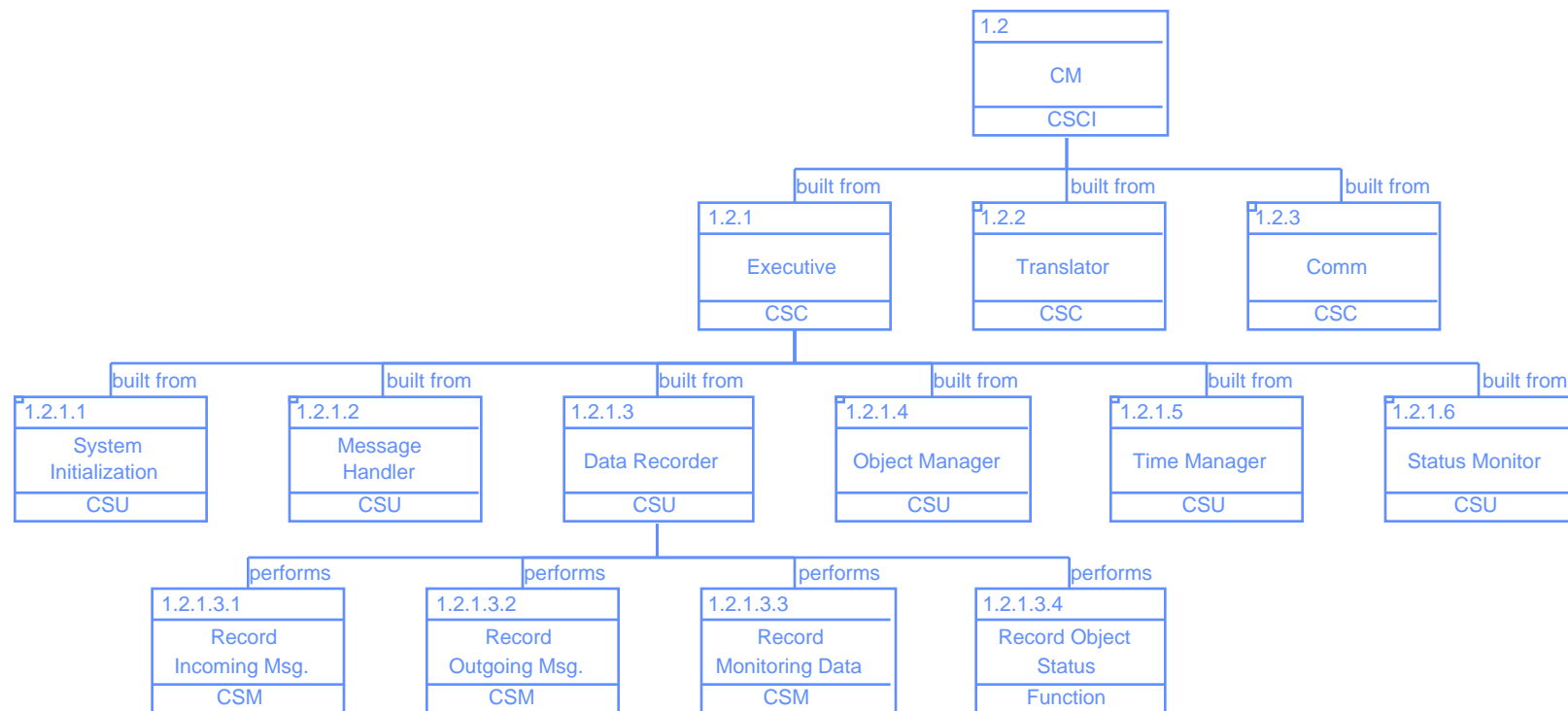
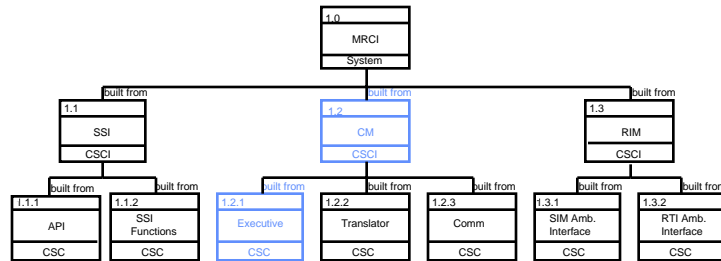
CM Software Hierarchy (13 of 41)



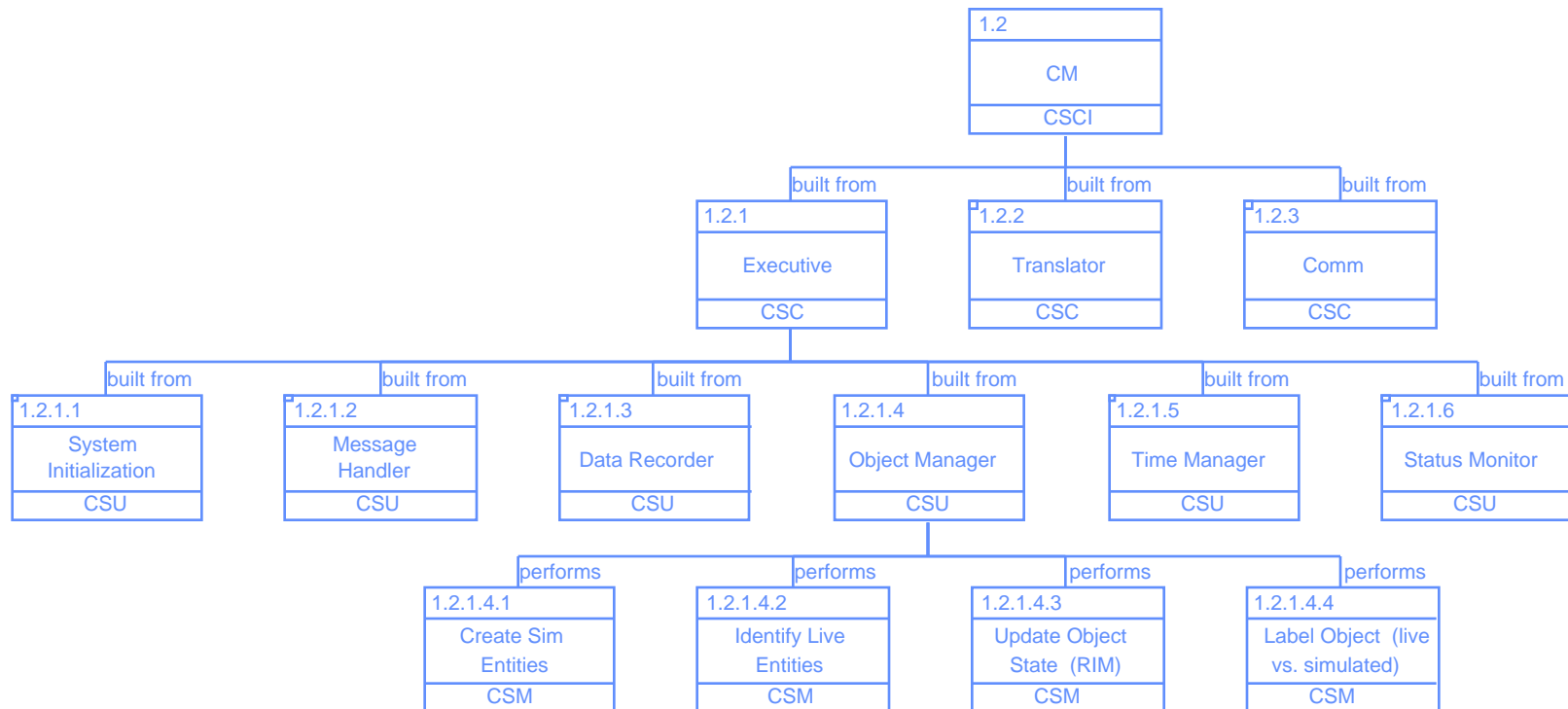
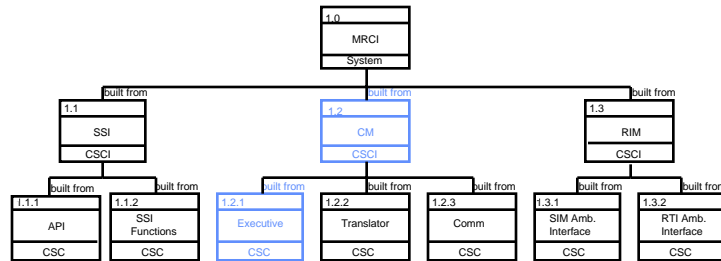
CM Software Hierarchy (14 of 41)



CM Software Hierarchy (15 of 41)



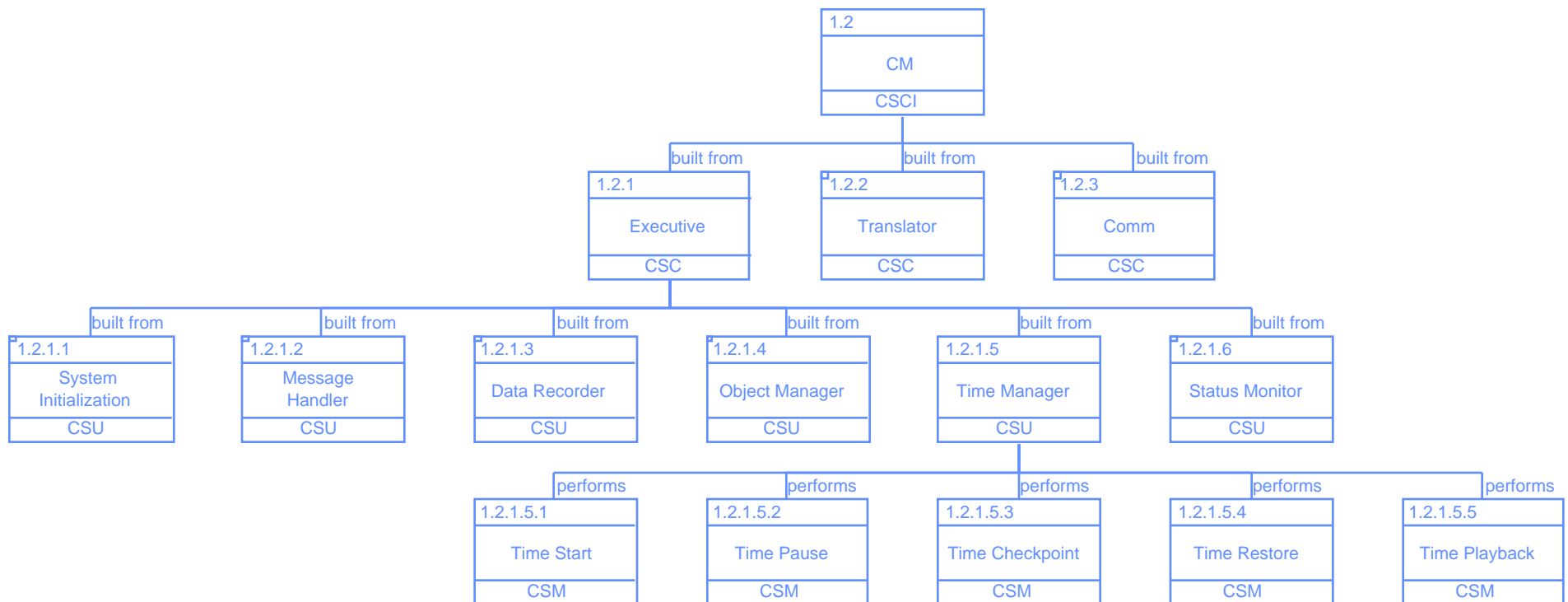
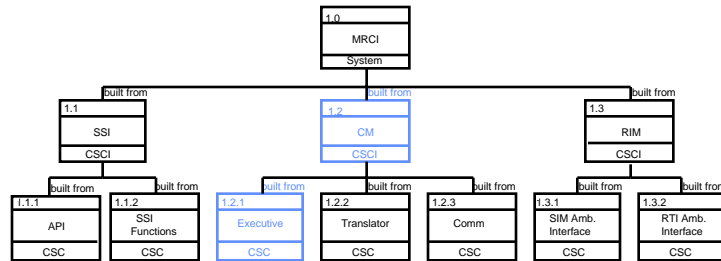
CM Software Hierarchy (16 of 41)



MRCI Critical Design Review - 14 August, 1996



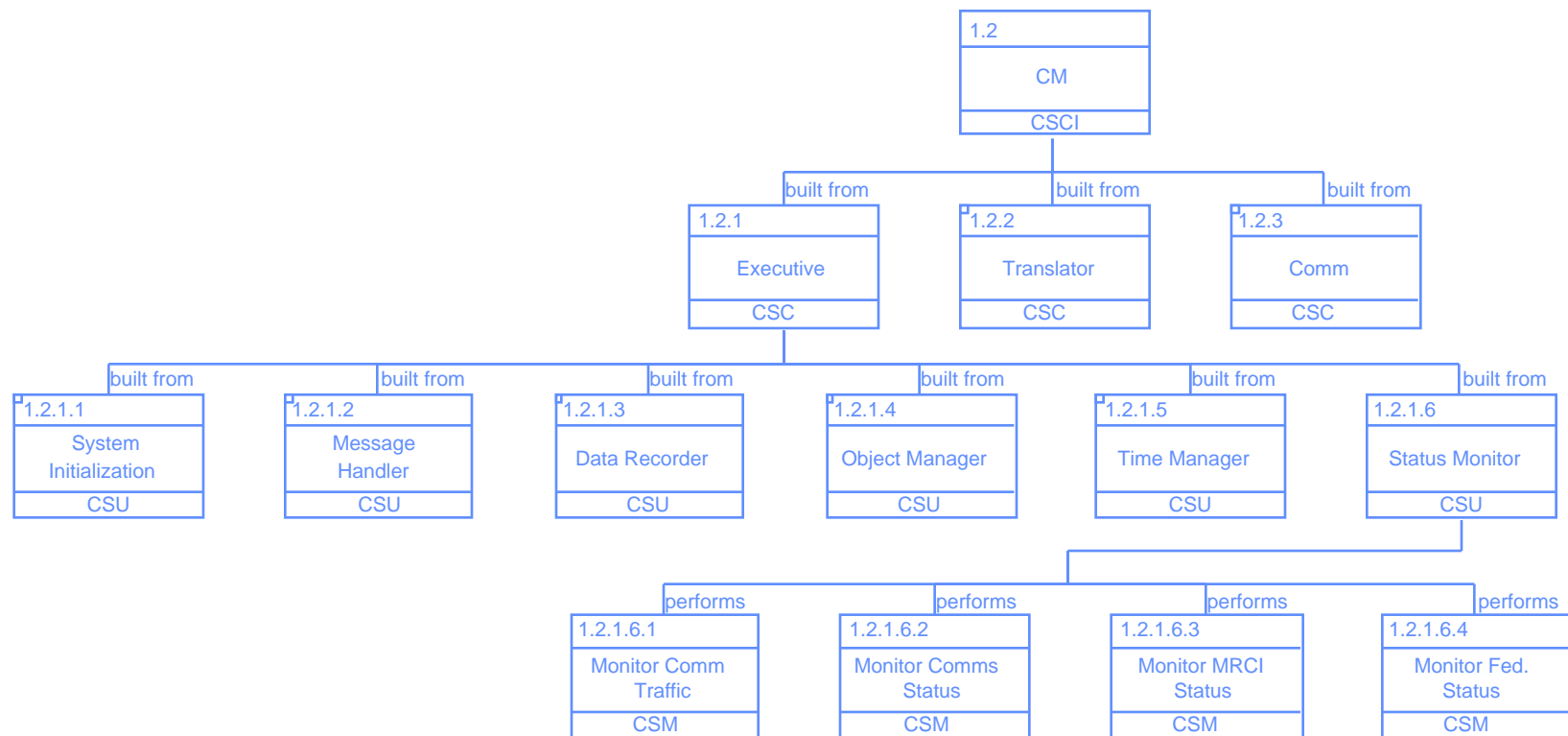
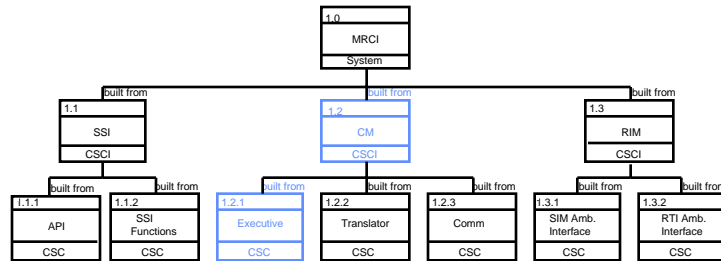
CM Software Hierarchy (17 of 41)



MRCI Critical Design Review - 14 August, 1996



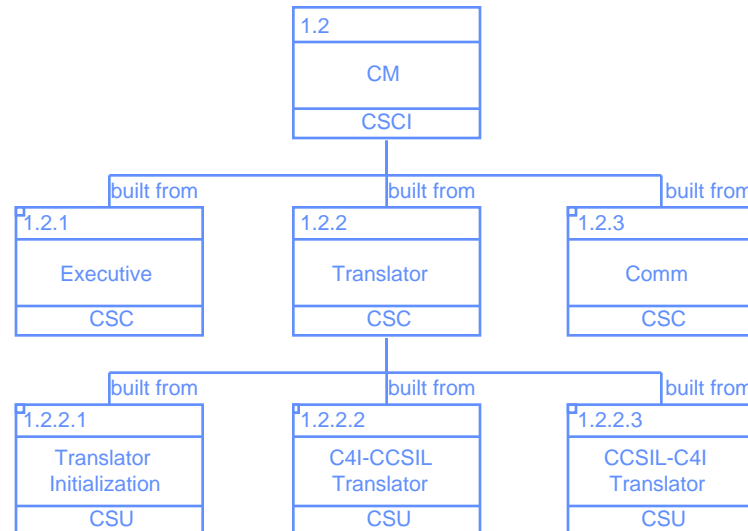
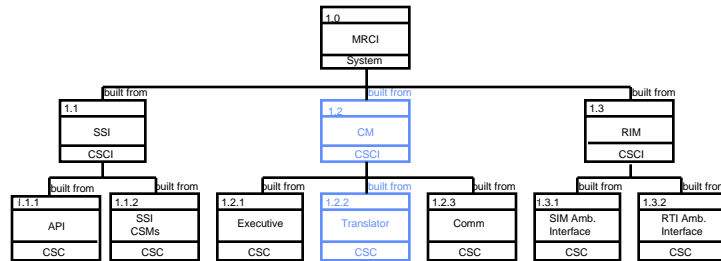
CM Software Hierarchy (18 of 41)



MRCI Critical Design Review - 14 August, 1996



CM Software Hierarchy (19 of 41)



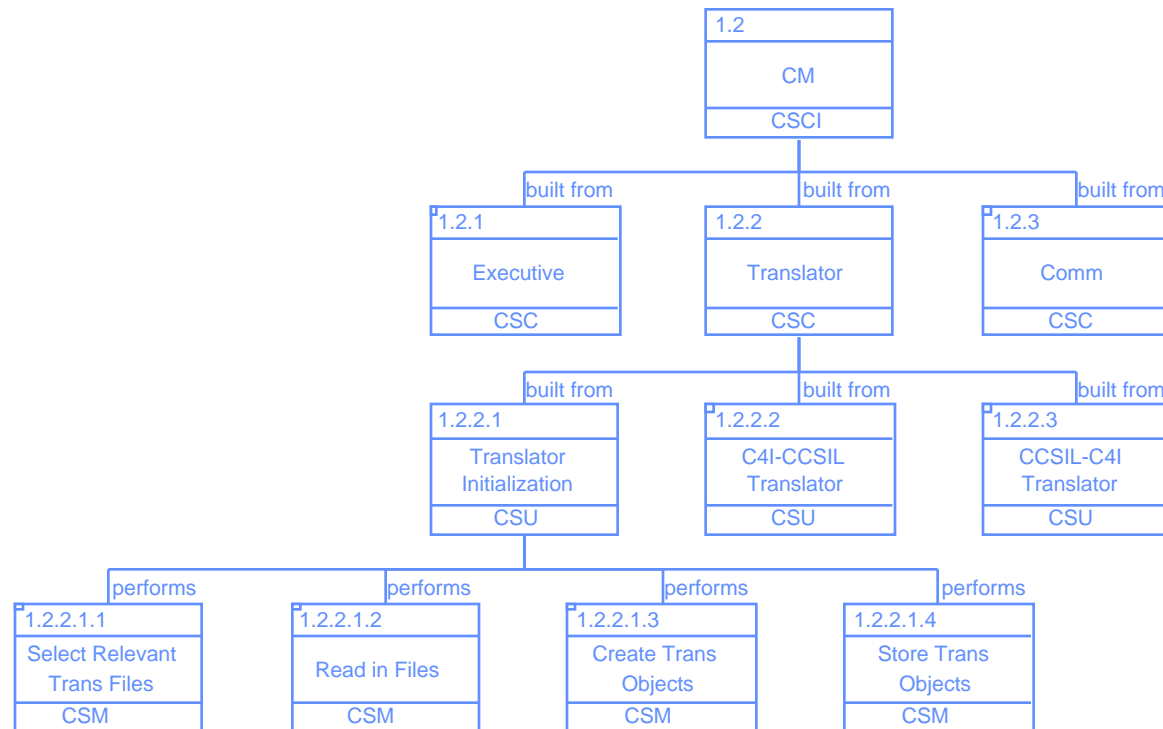
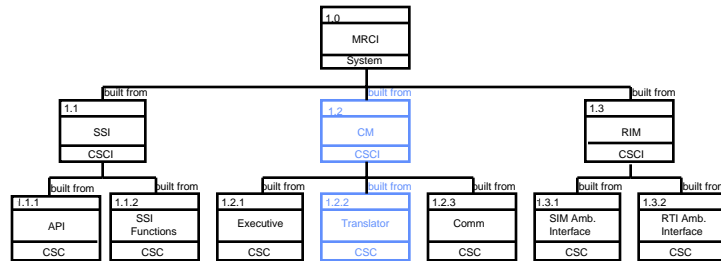
MRCI Critical Design Review - 14 August, 1996



CSCI/CSC/CSU	Definition
Translator Initialization (1.2.2.1)	This component initializes the proper mapping files to perform the translation of CCSIL and C4I messages.
C4I-CCSIL Translator (1.2.2.2)	This component translates the C4I messages into CCSIL.
CCSIL-C4I Translator (1.2.2.3)	This component translates the CCSIL messages into a C4I message protocol.



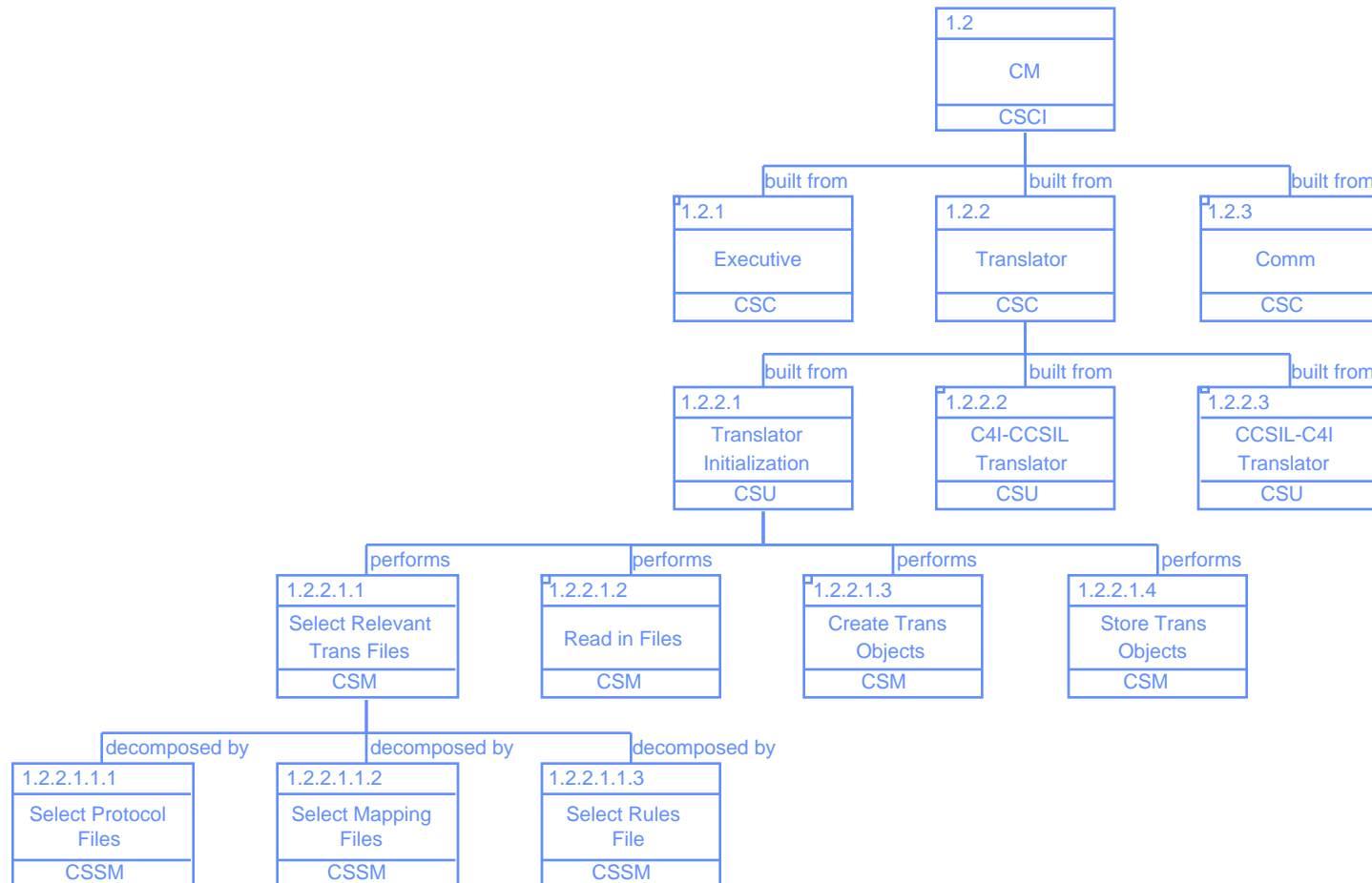
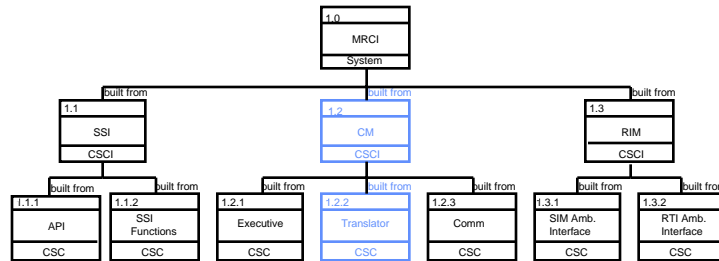
CM Software Hierarchy (20 of 41)



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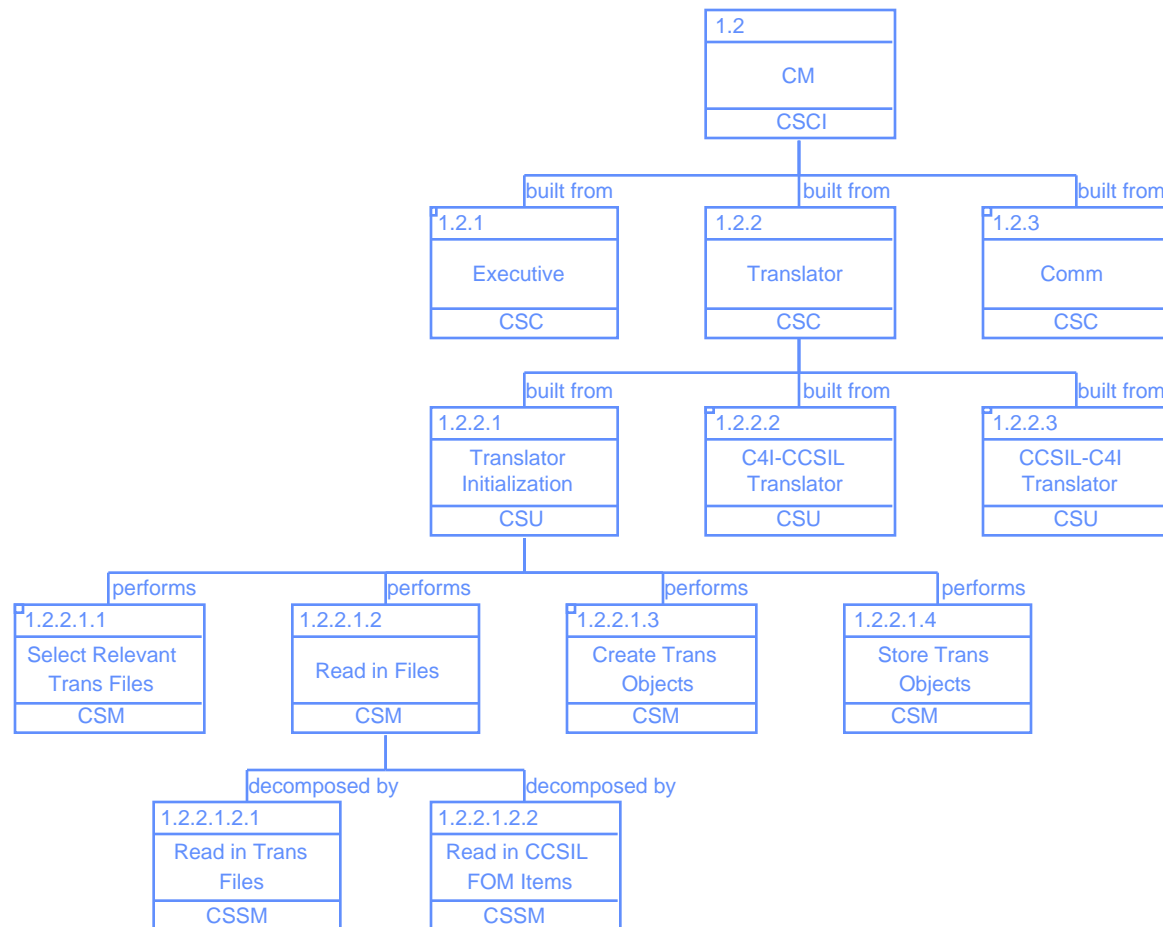
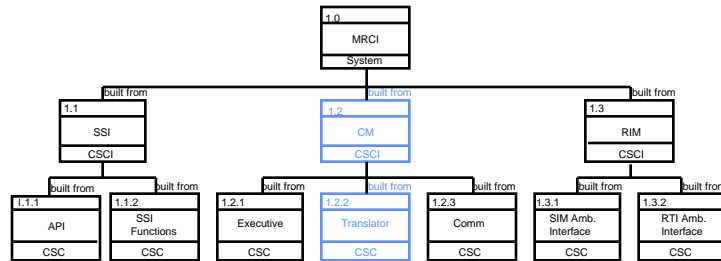
CM Software Hierarchy (21 of 41)



MRCI Critical Design Review - 14 August, 1996



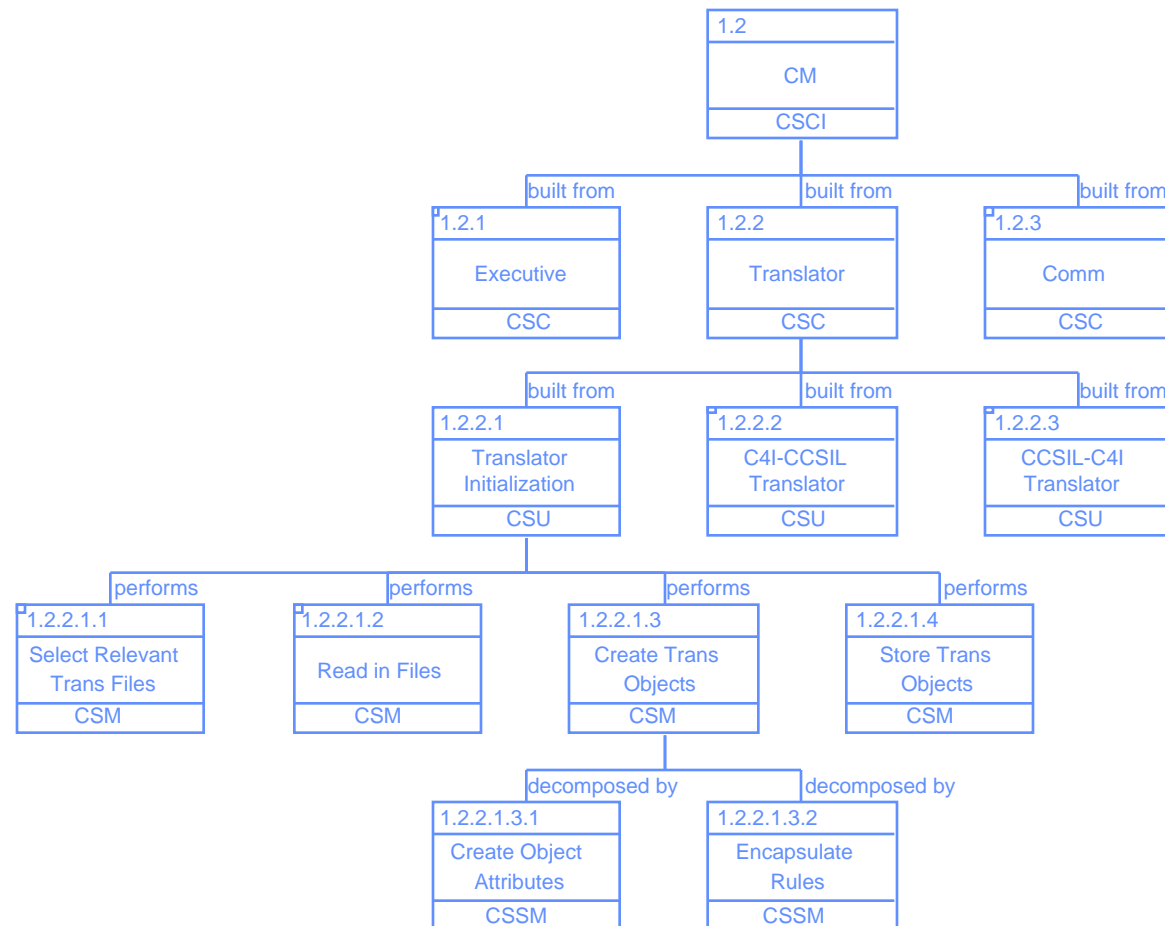
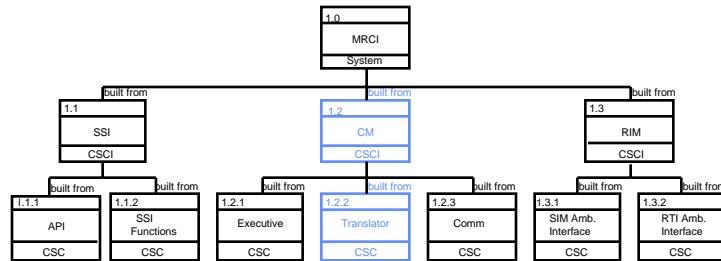
CM Software Hierarchy (22 of 41)



MRCI Critical Design Review - 14 August, 1996



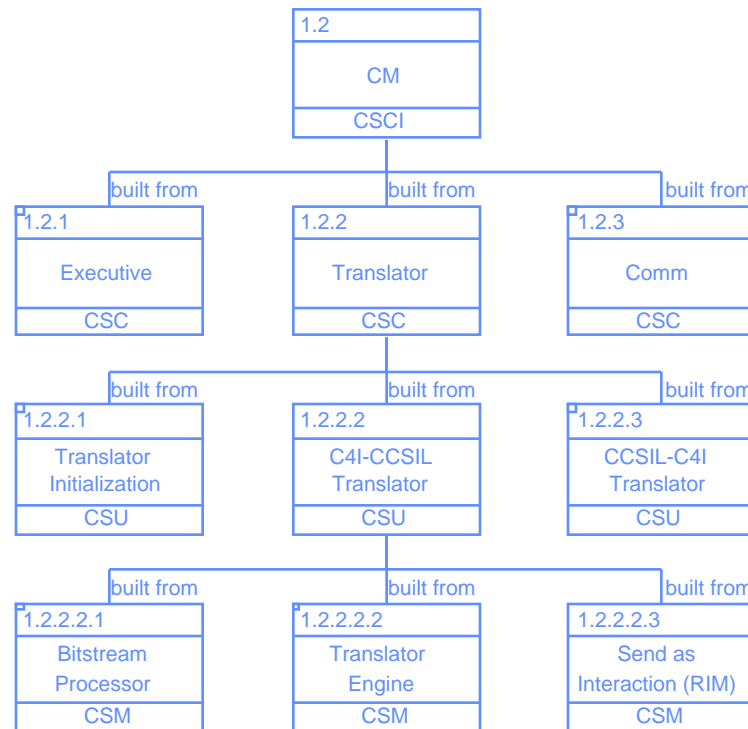
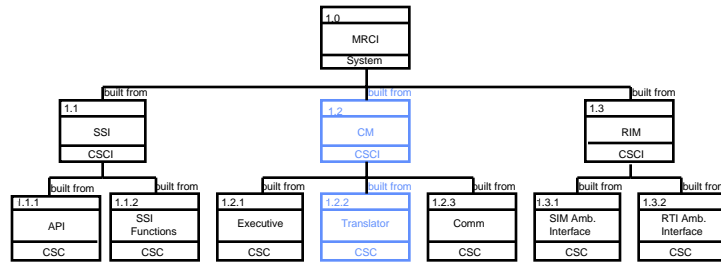
CM Software Hierarchy (23 of 41)



MRCI Critical Design Review - 14 August, 1996



CM Software Hierarchy (24 of 41)



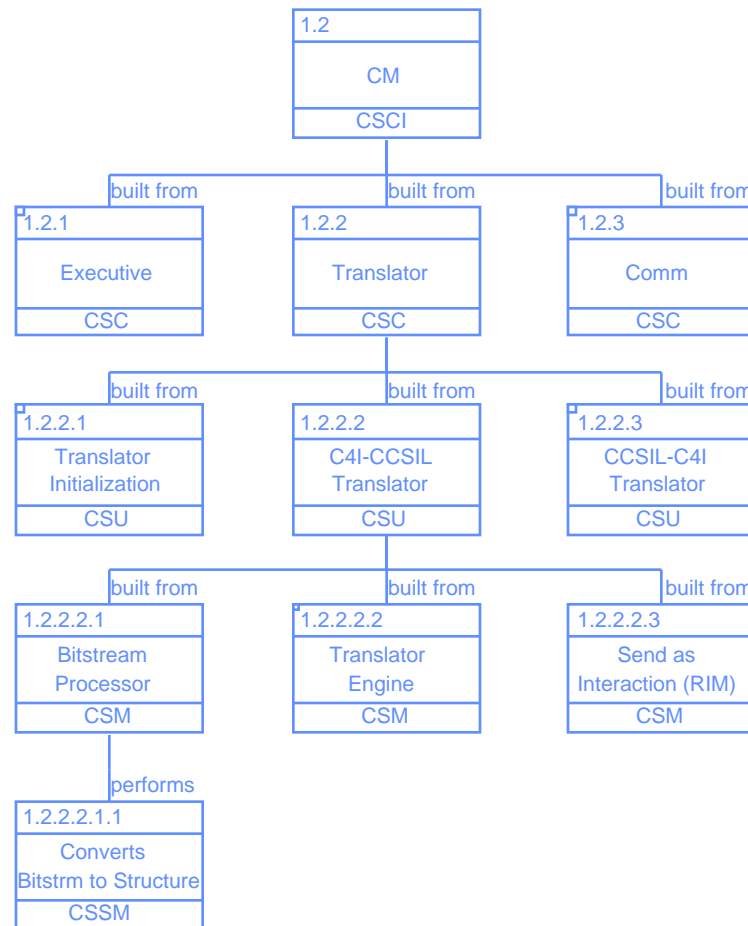
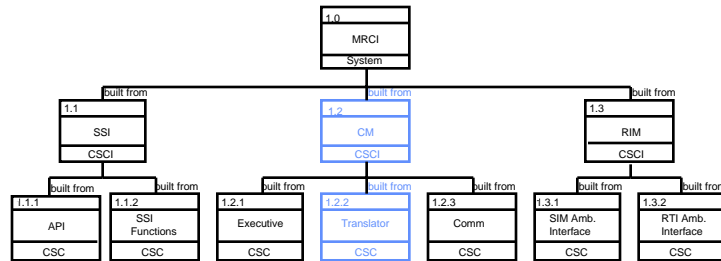
MRCI Critical Design Review - 14 August, 1996



Modules/ Sub-Modules	Definition
Bitstream Processor (1.2.2.2.1)	This component converts a Bitstream to a structure.
Translator Engine (1.2.2.2.2)	This component performs the translation of the C4I message to the formatted CCSIL message
Send As Interaction (RIM) (1.2.2.2.3)	This component send the translated message to the RTI as an interaction.



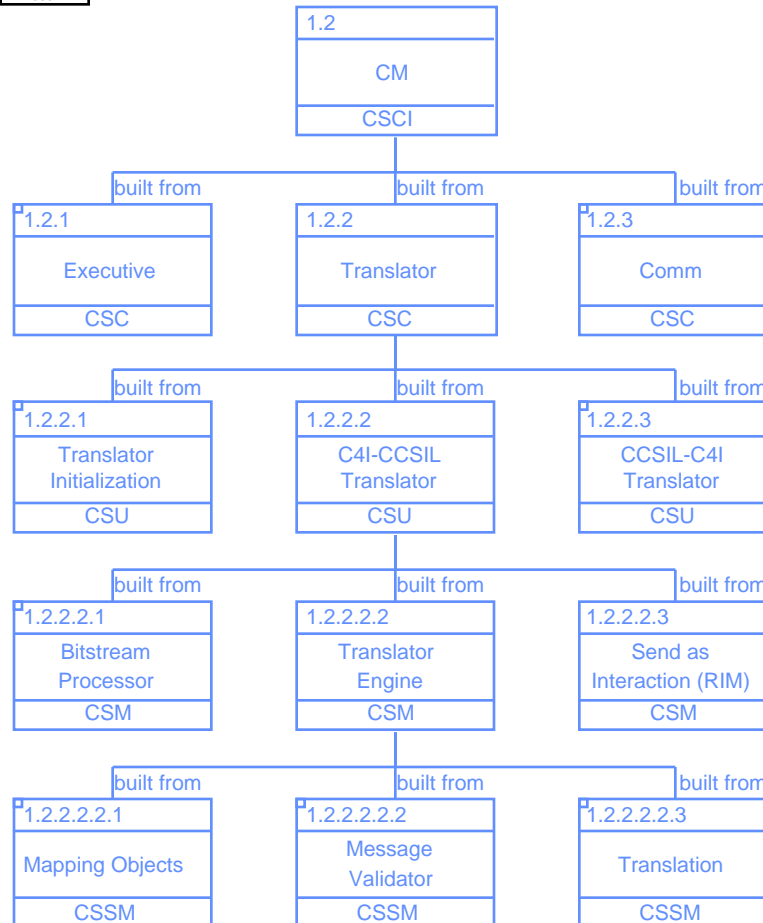
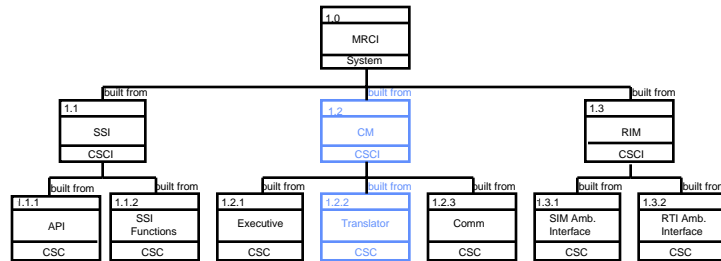
CM Software Hierarchy (25 of 41)



MRCI Critical Design Review - 14 August, 1996



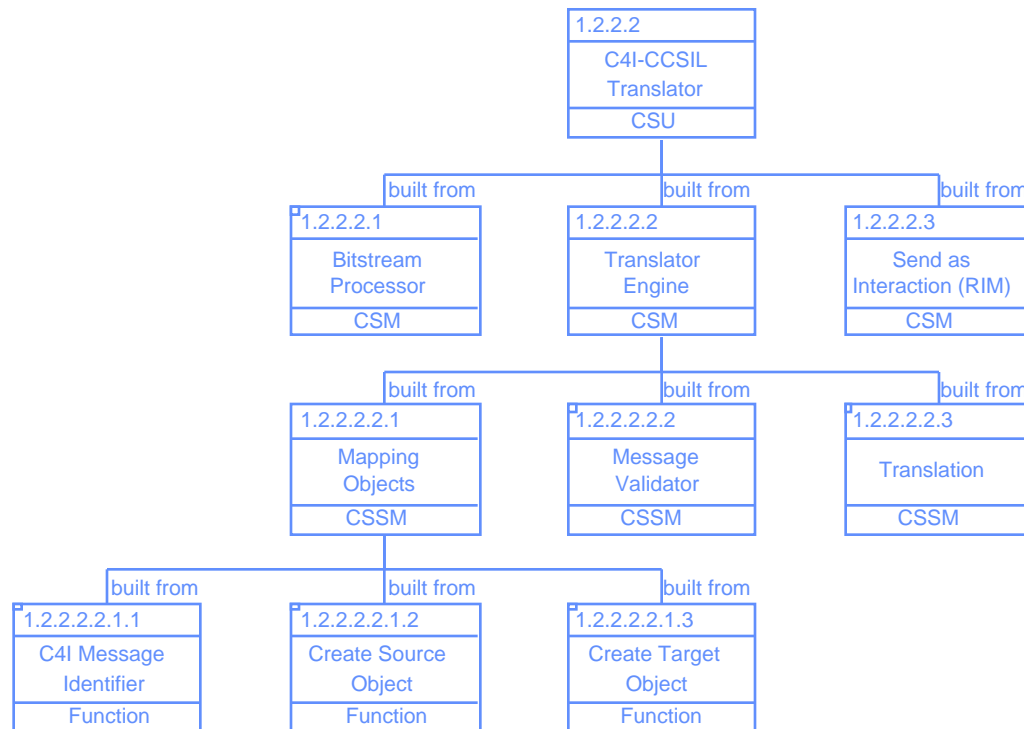
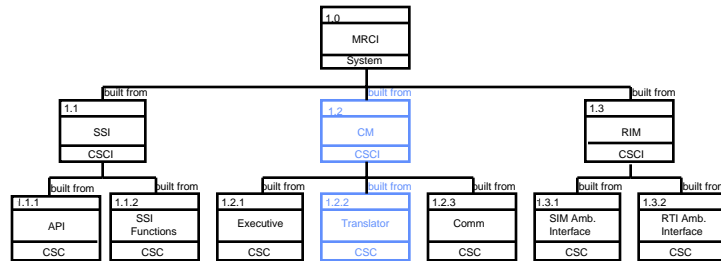
CM Software Hierarchy (26 of 41)



MRCI Critical Design Review - 14 August, 1996



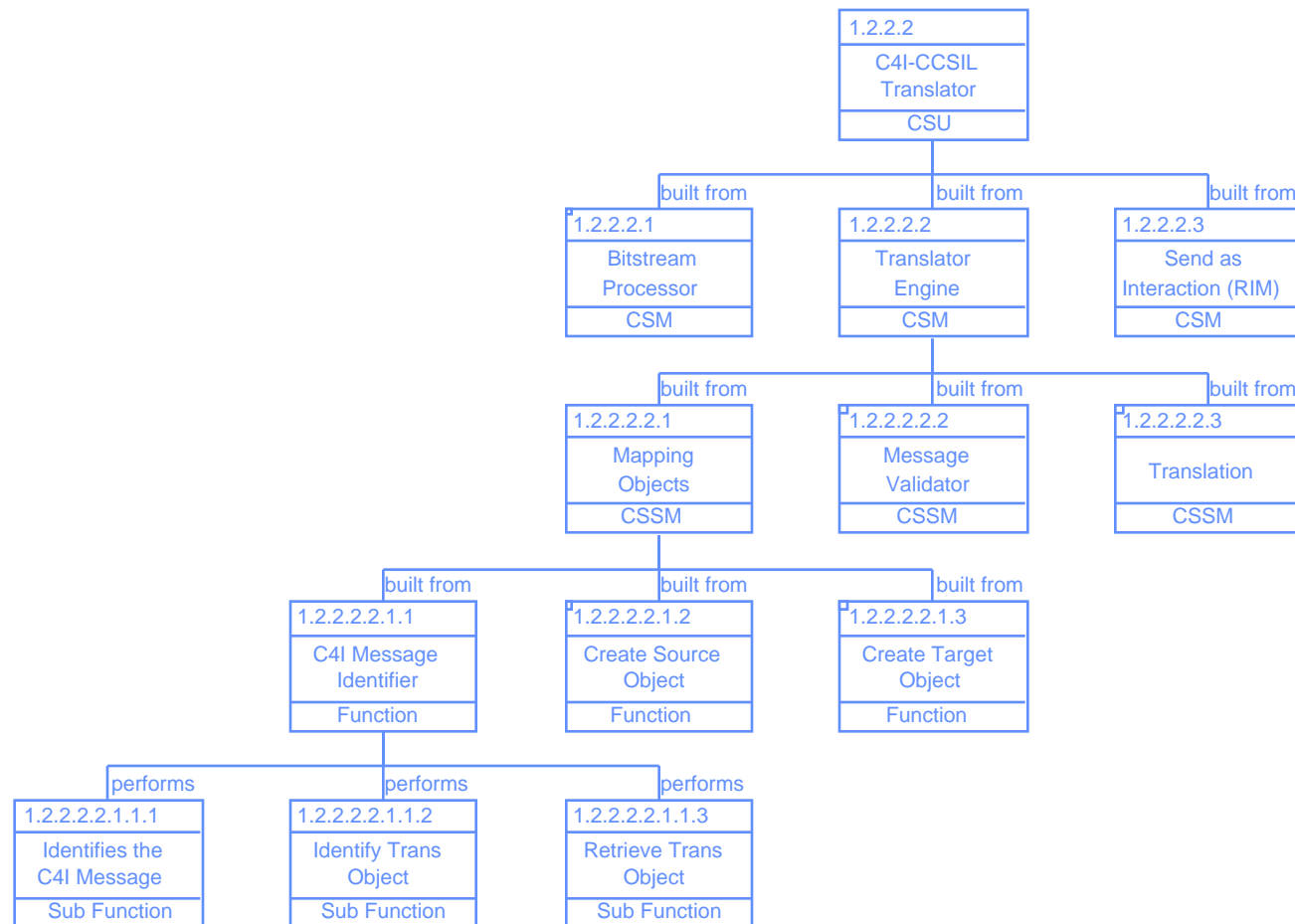
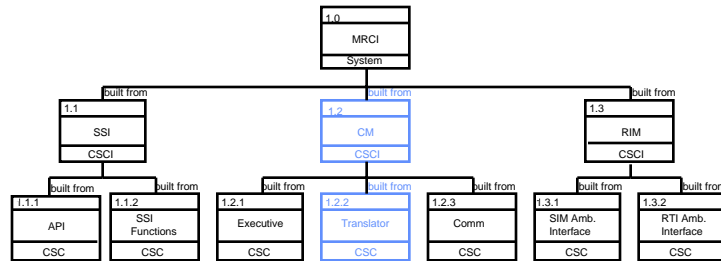
CM Software Hierarchy (27 of 41)



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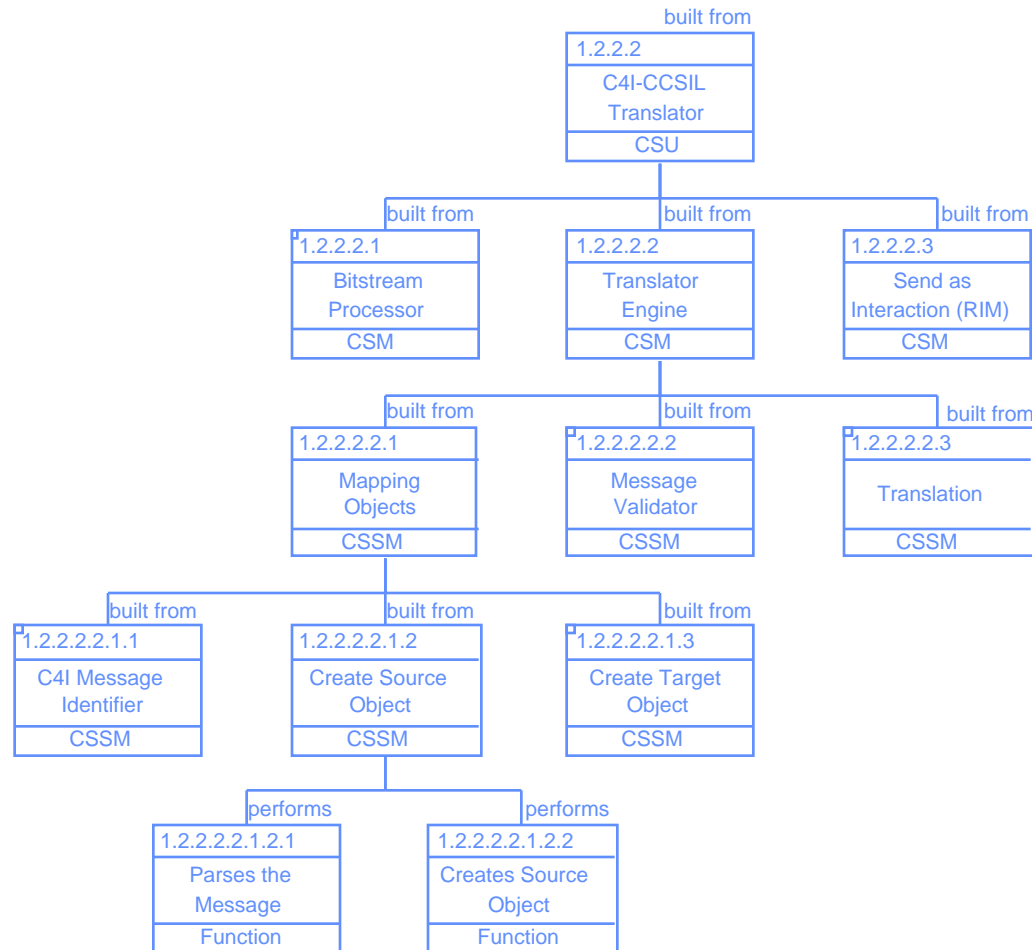
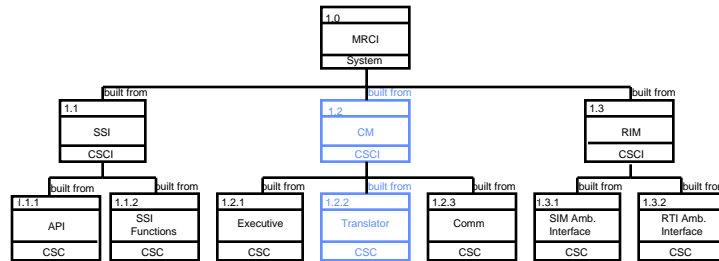
CM Software Hierarchy (28 of 41)



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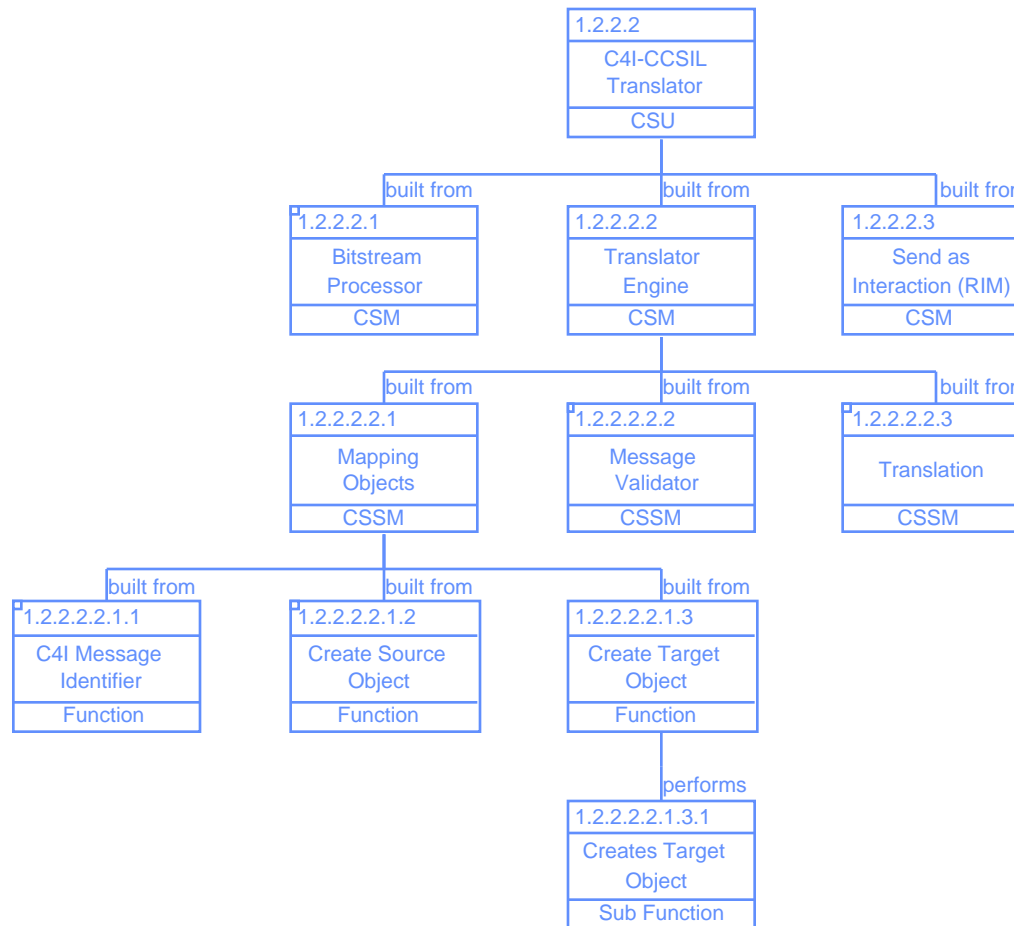
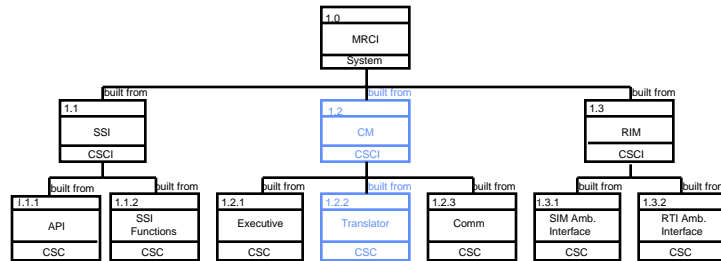
CM Software Hierarchy (29 of 41)



MRCI Critical Design Review - 14 August, 1996



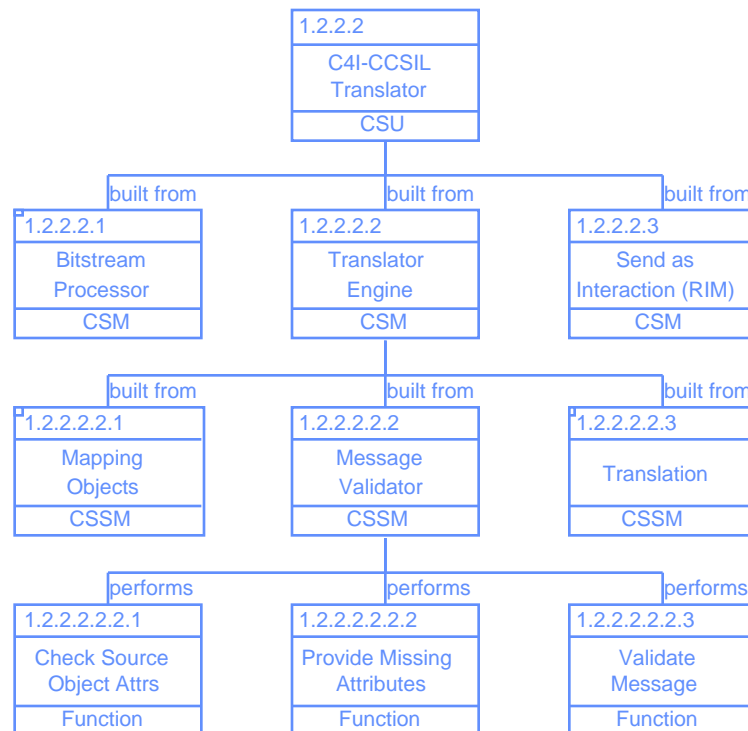
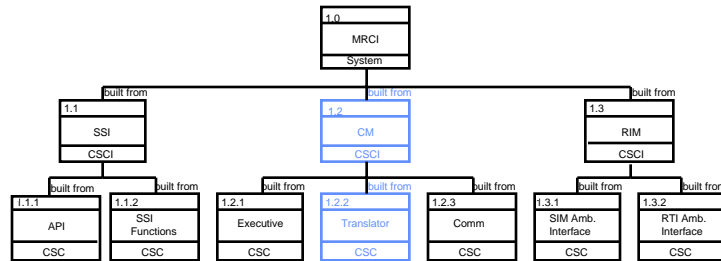
CM Software Hierarchy (30 of 41)



MRCI Critical Design Review - 14 August, 1996



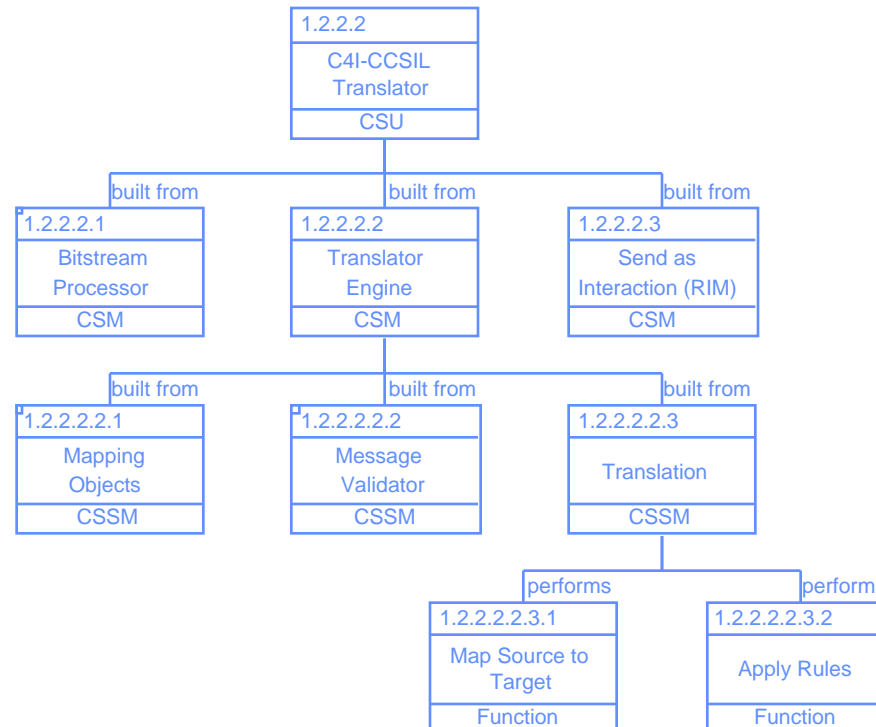
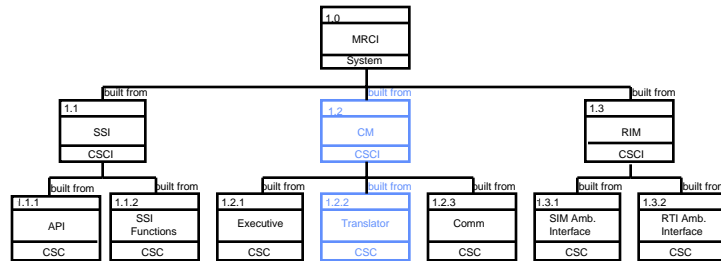
CM Software Hierarchy (31 of 41)



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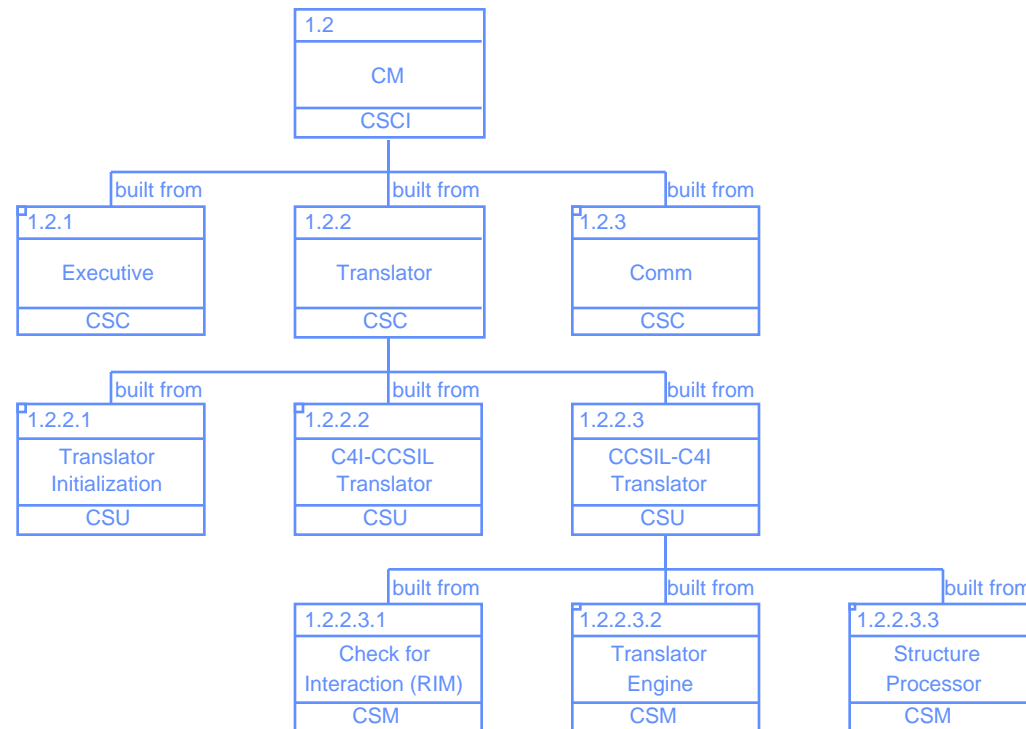
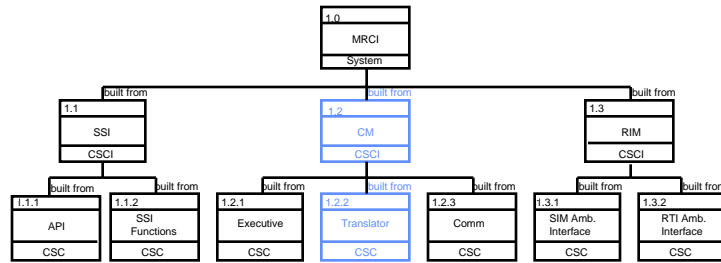
CM Software Hierarchy (32 of 41)



MRCI Critical Design Review - 14 August, 1996



CM Software Hierarchy (33 of 41)



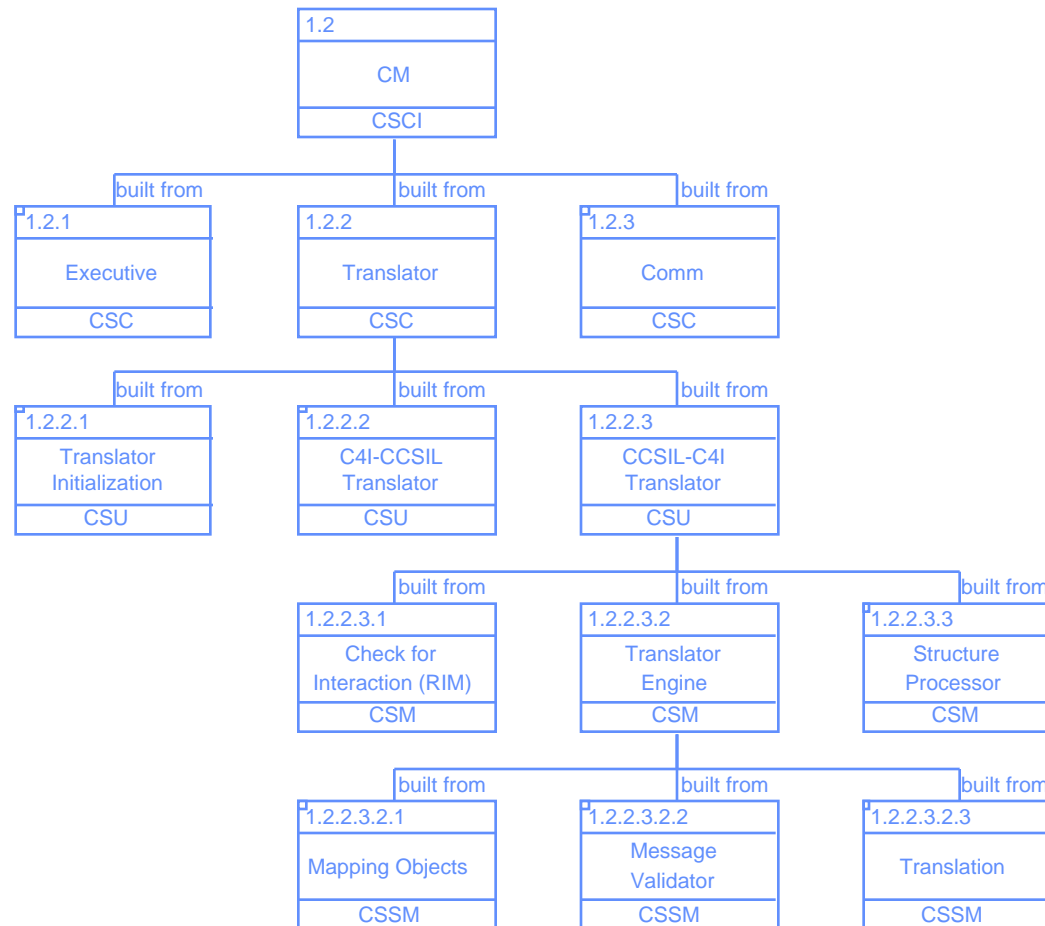
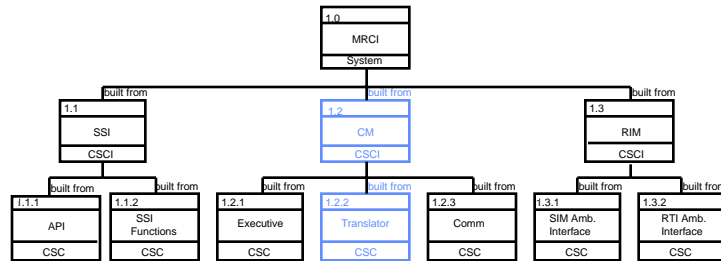
MRCI Critical Design Review - 14 August, 1996



Modules/ Sub-Modules	Definition
Check for Interaction (RIM) (1.2.2.3.1)	This component checks to see if an interaction has been received.
Translator Engine (1.2.2.3.2)	This component performs the translation of the CCSIL message to the formatted C4I message.
Structure Processor (1.2.2.3.3)	This component converts a structure to a Bitstream.



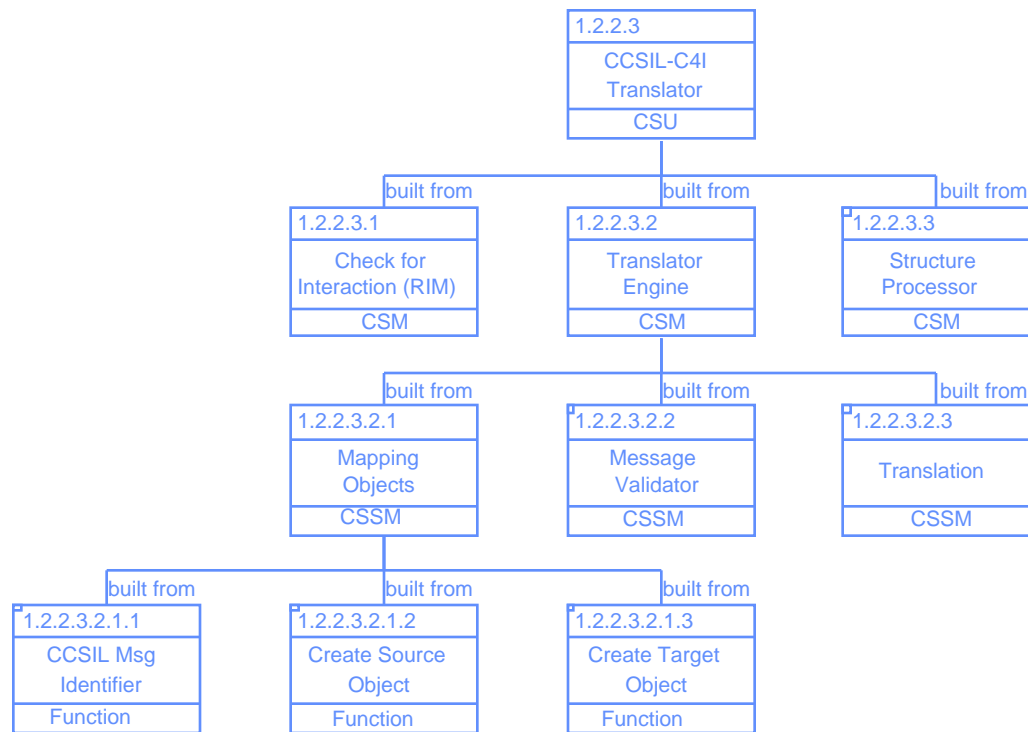
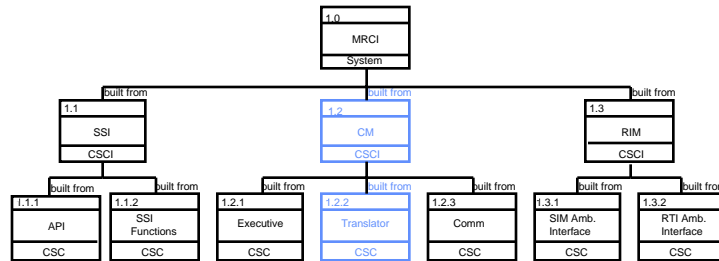
CM Software Hierarchy (34 of 41)



MRCI Critical Design Review - 14 August, 1996



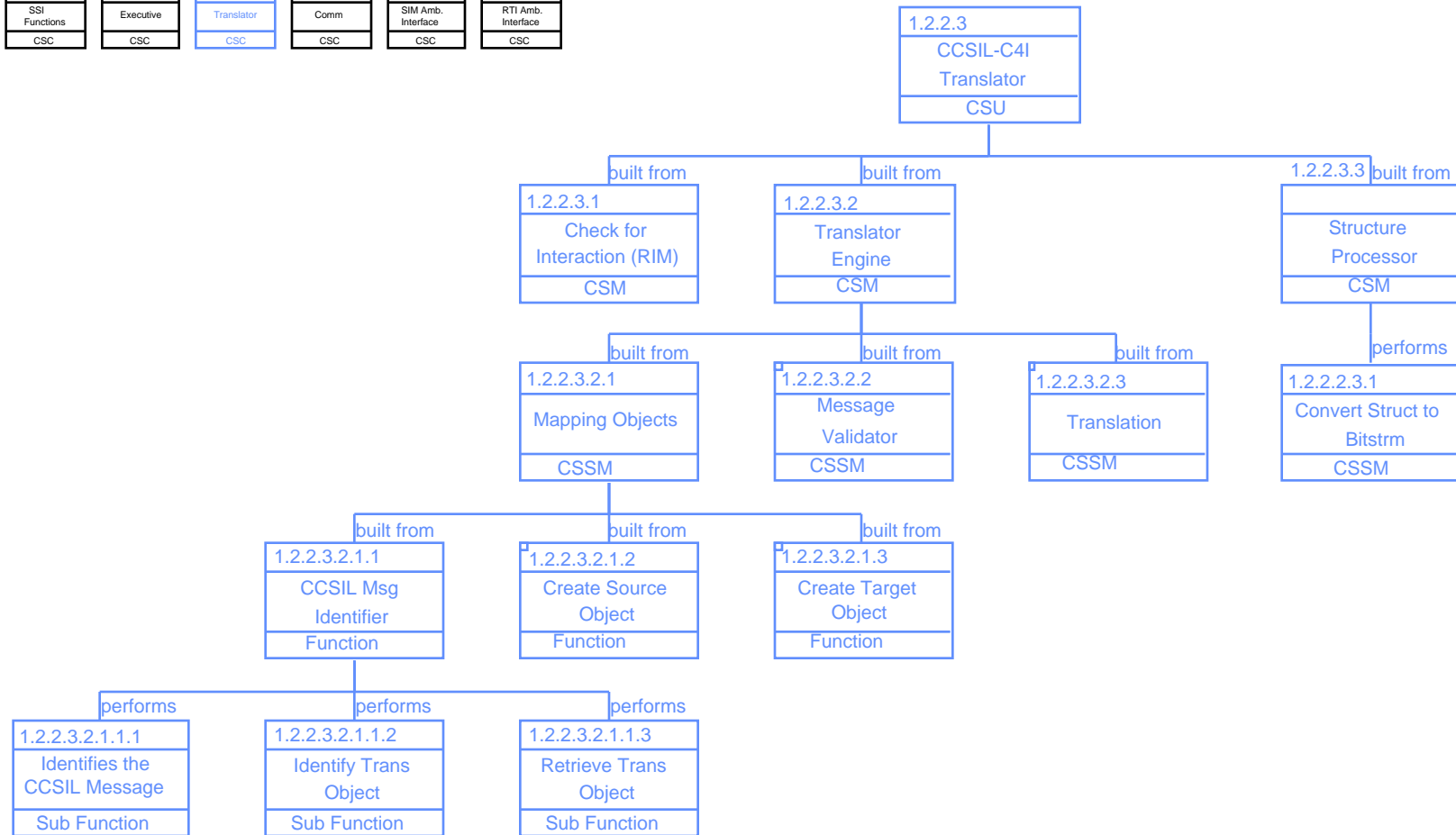
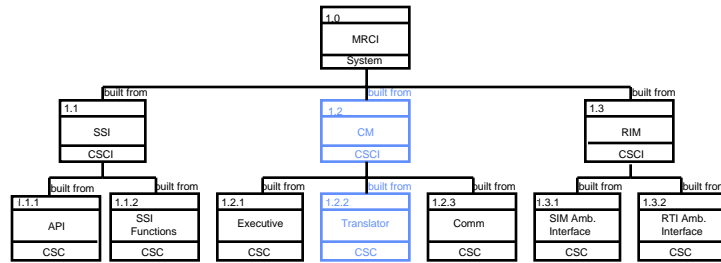
CM Software Hierarchy (35 of 41)



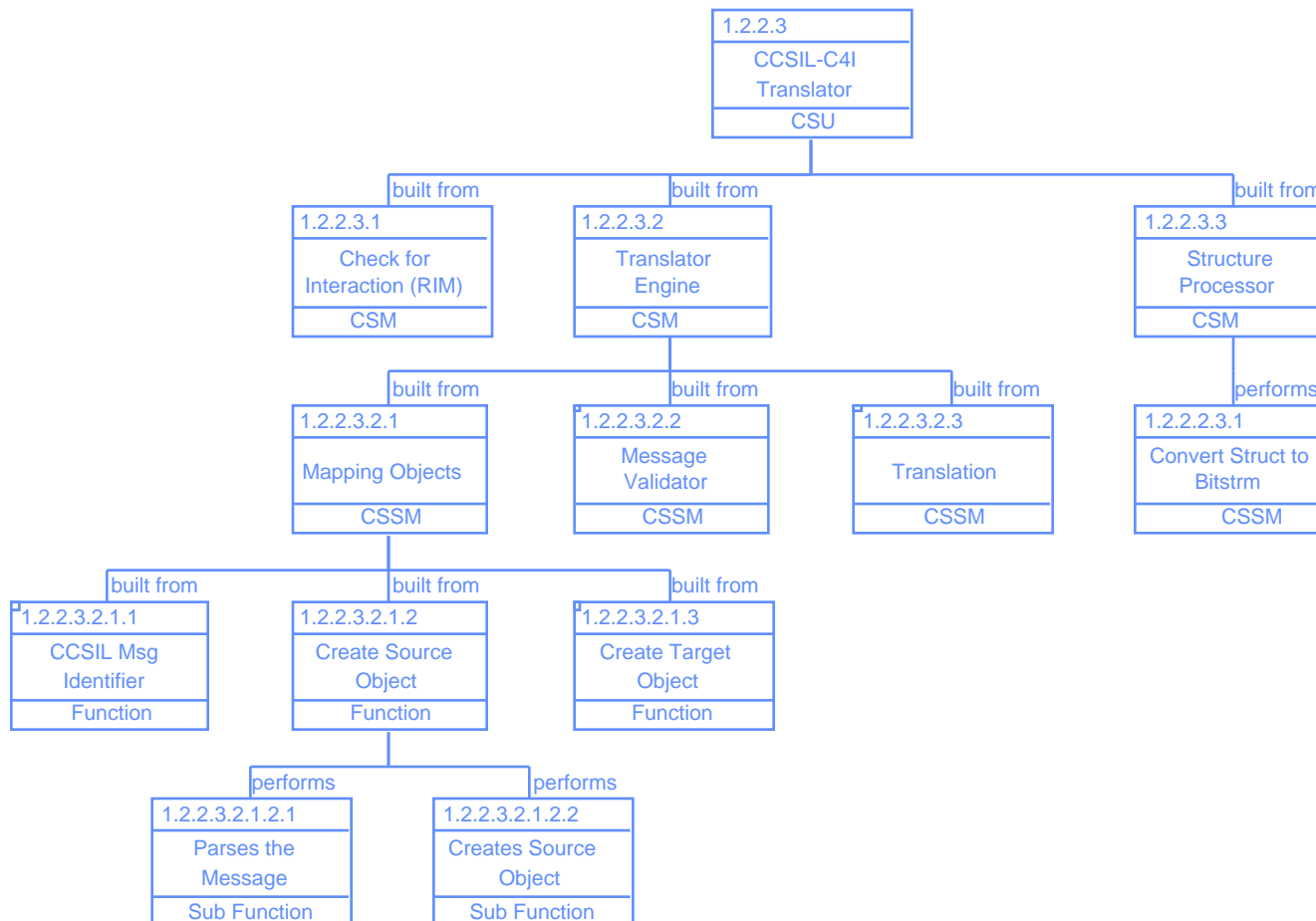
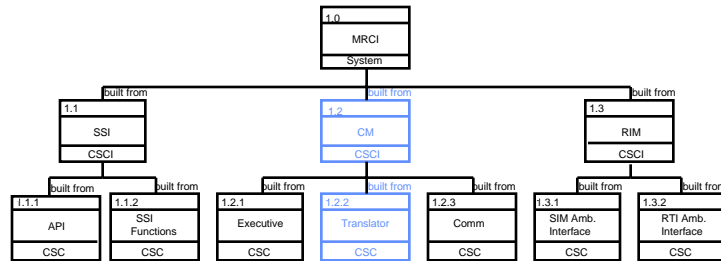
MRCI Critical Design Review - 14 August, 1996



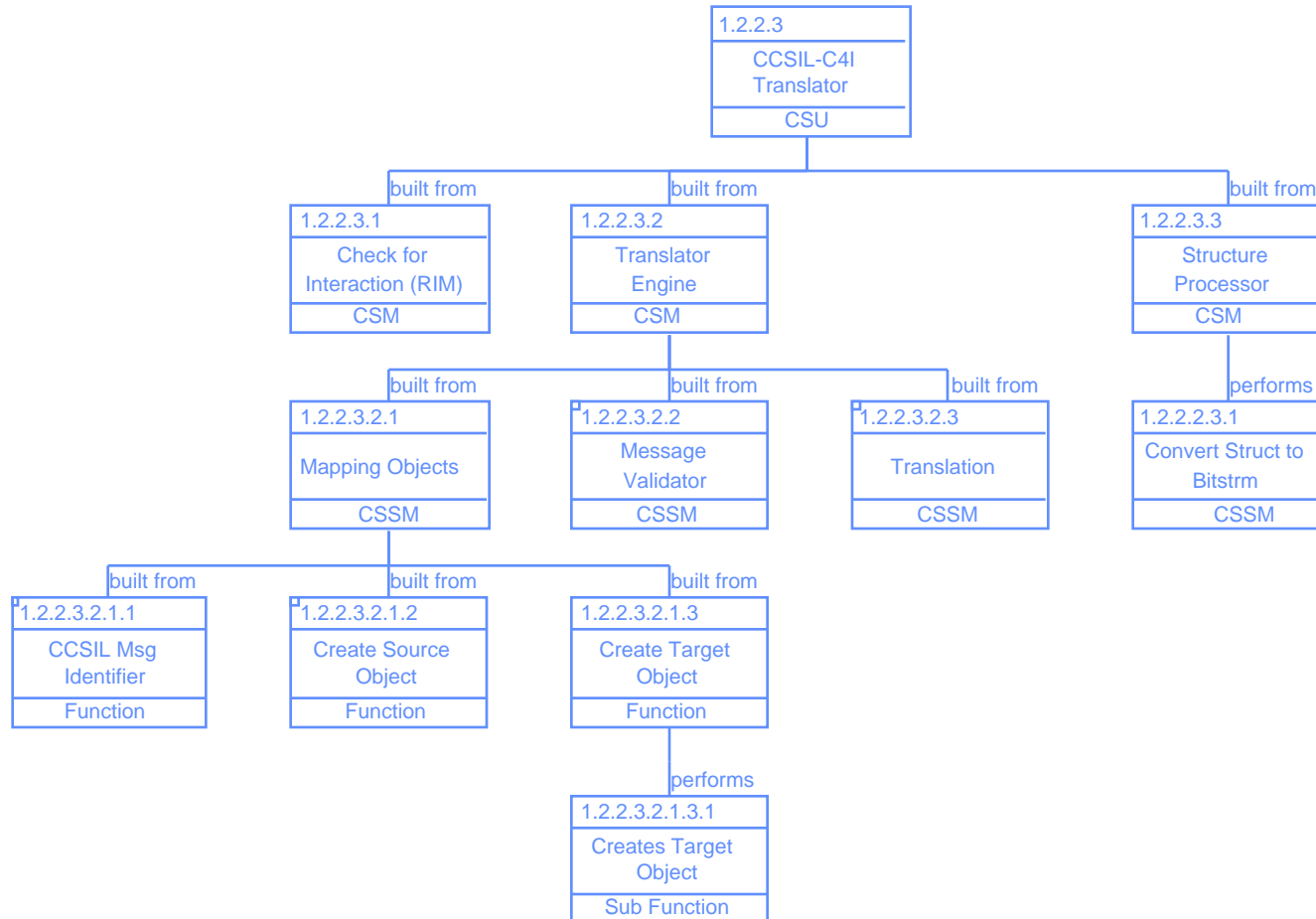
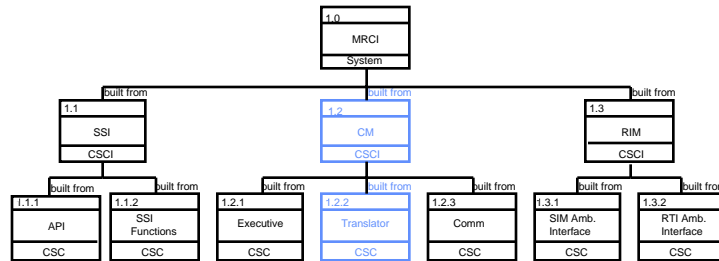
CM Software Hierarchy (36 of 41)



CM Software Hierarchy (37 of 41)



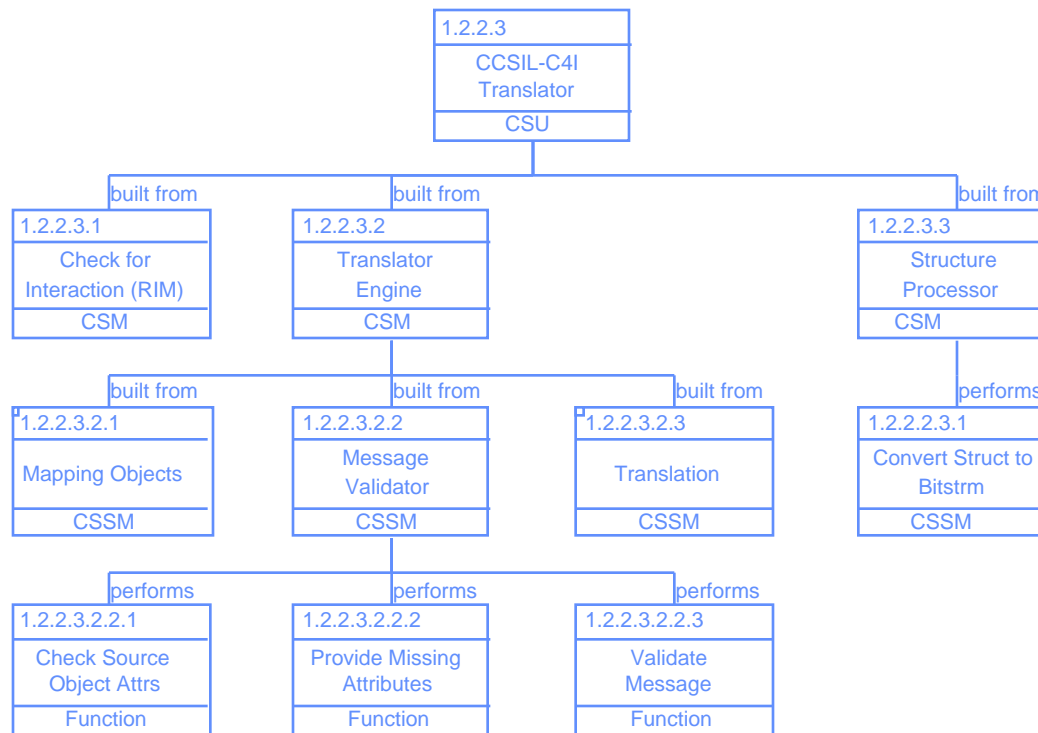
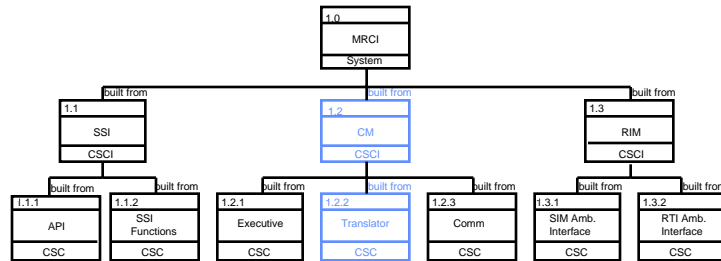
CM Software Hierarchy (38 of 41)



MRCI Critical Design Review - 14 August, 1996



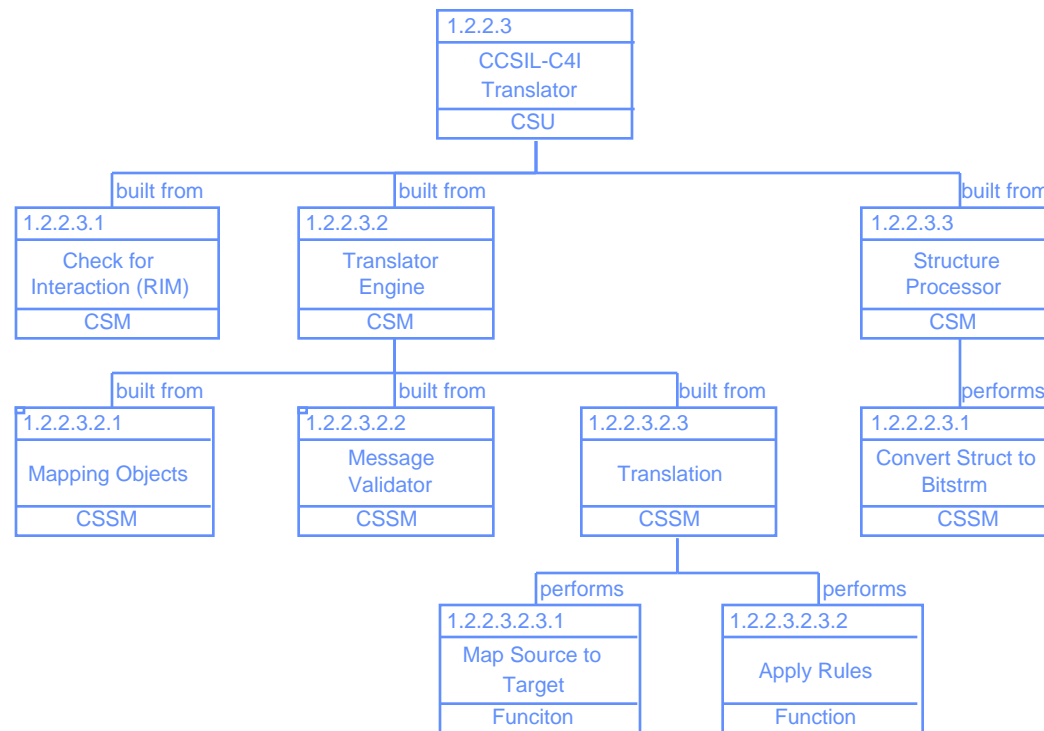
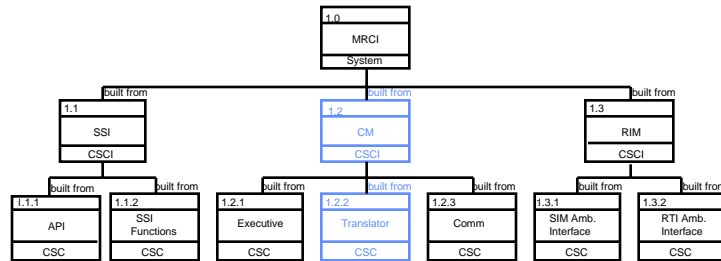
CM Software Hierarchy (39 of 41)



MRCI Critical Design Review - 14 August, 1996



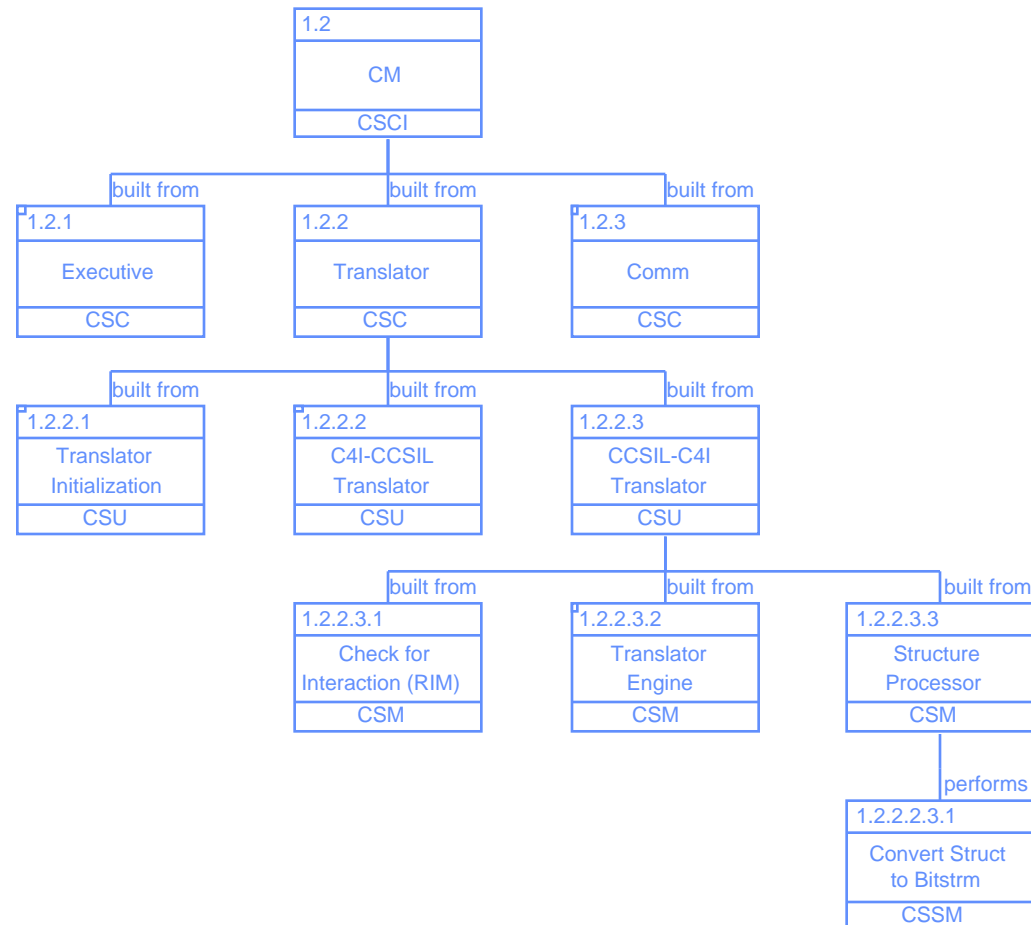
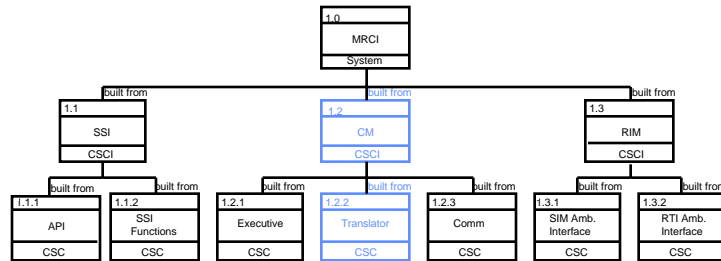
CM Software Hierarchy (40 of 41)



MRCI Critical Design Review - 14 August, 1996



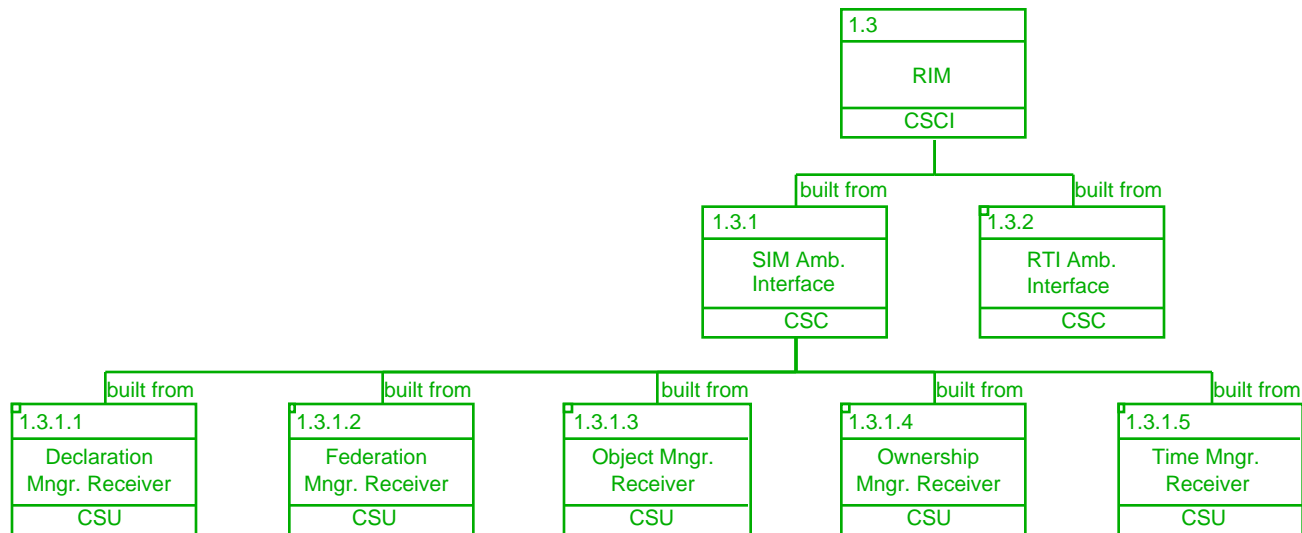
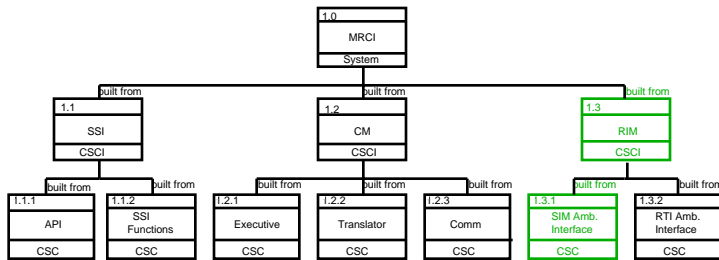
CM Software Hierarchy (41 of 41)



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RIM Software Hierarchy (1 of 13)



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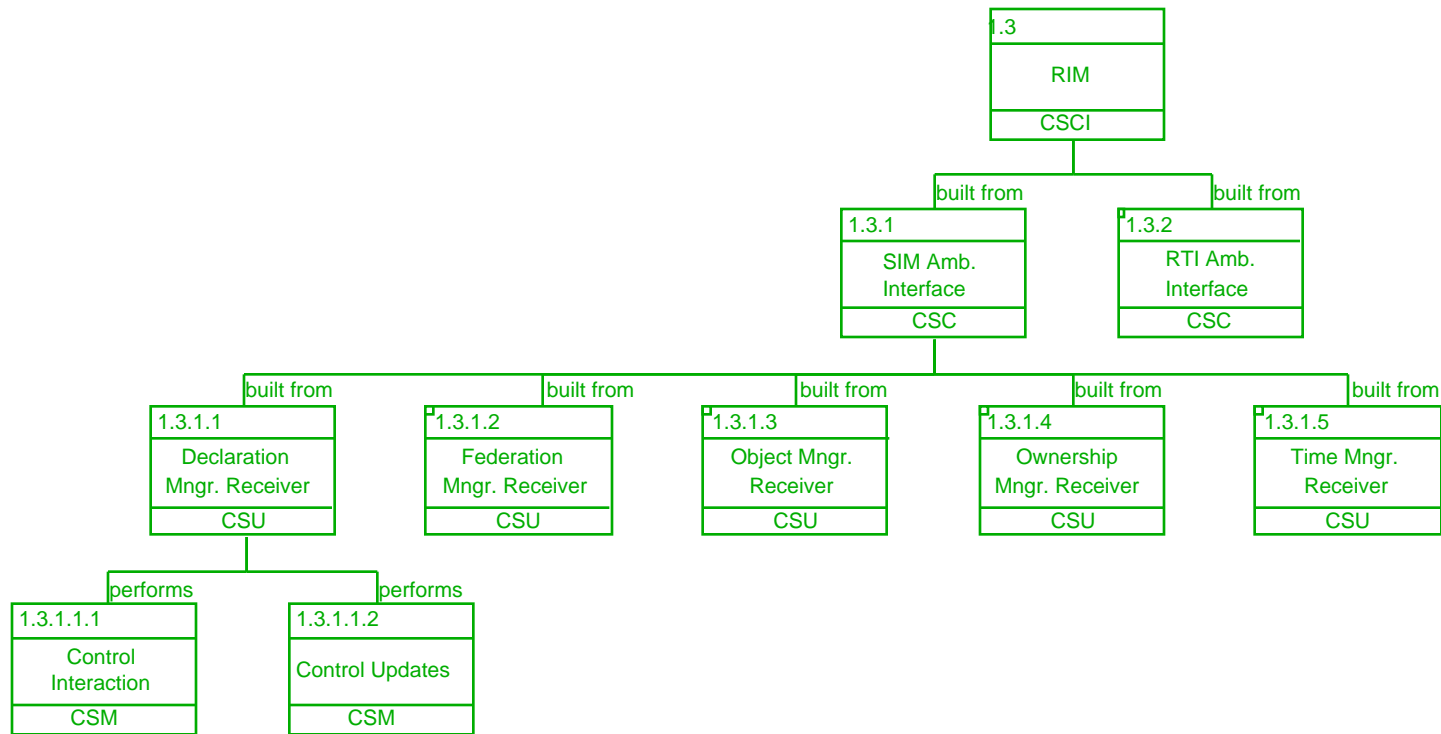
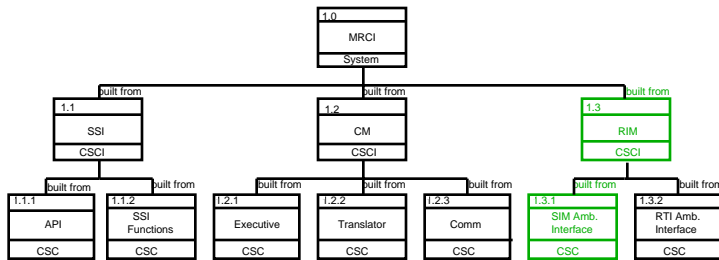
CSCI/CSC/CSU	Definition
RIM (1.3)	This module allows the Common Modules to interface with the RTI.
SIM Ambassador Interface (1.3.1)	This module interfaces with the SIM Ambassador.
RTI Ambassador Interface (1.3.2)	This module interfaces with the RTI Ambassador.



CSCI/CSC/CSU	Definition
Declaration Management Receiver (1.3.1.1)	This component receives from the Declaration Manager.
Federation Management Receiver (1.3.1.2)	This component receives from the Federation Manager.
Object Management Receiver (1.3.1.3)	This component receives from the Object Manager.
Ownership Management Receiver (1.3.1.4)	This component receives from the Ownership Manager.
Time Management Receiver (1.3.1.5)	This component receives from the Time Manager.



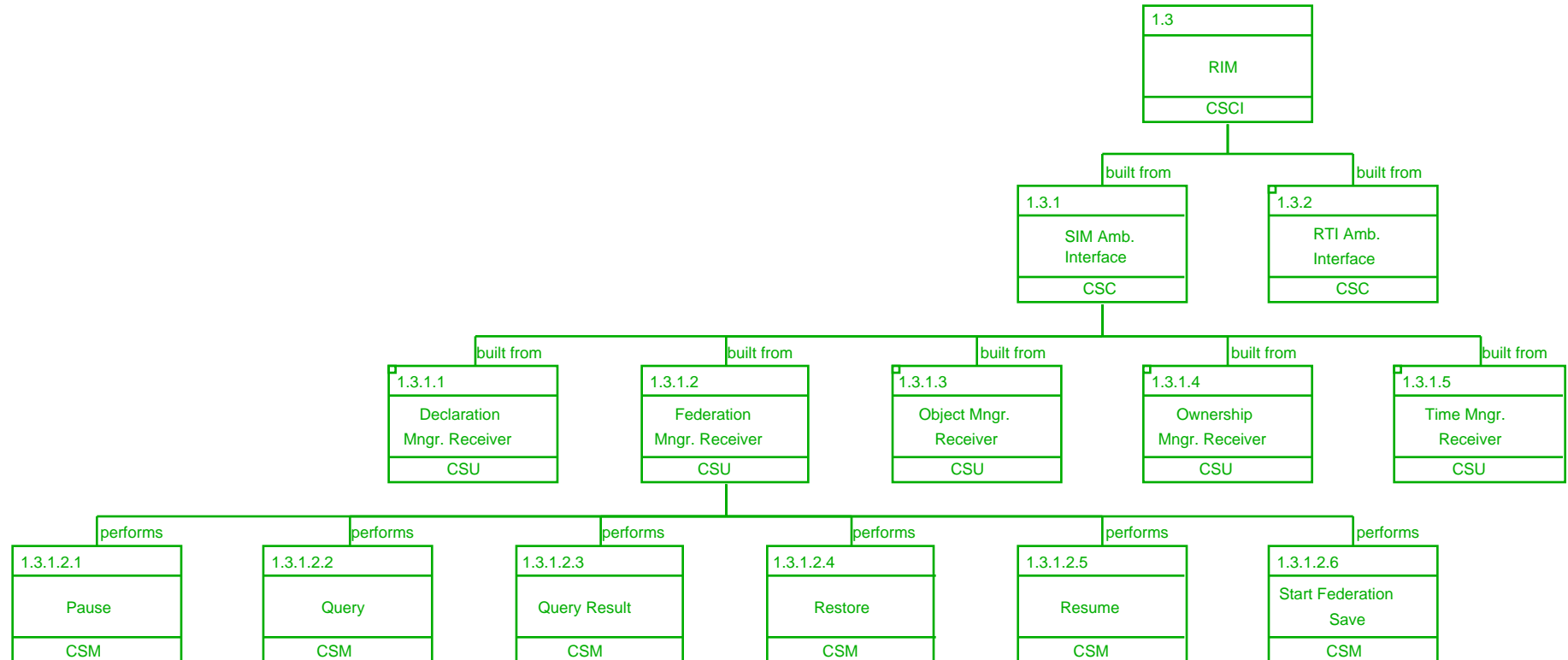
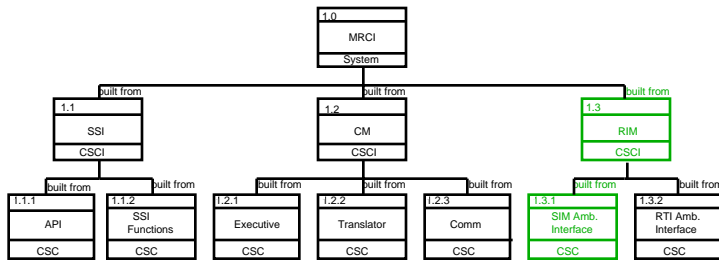
RIM Software Hierarchy (2 of 13)



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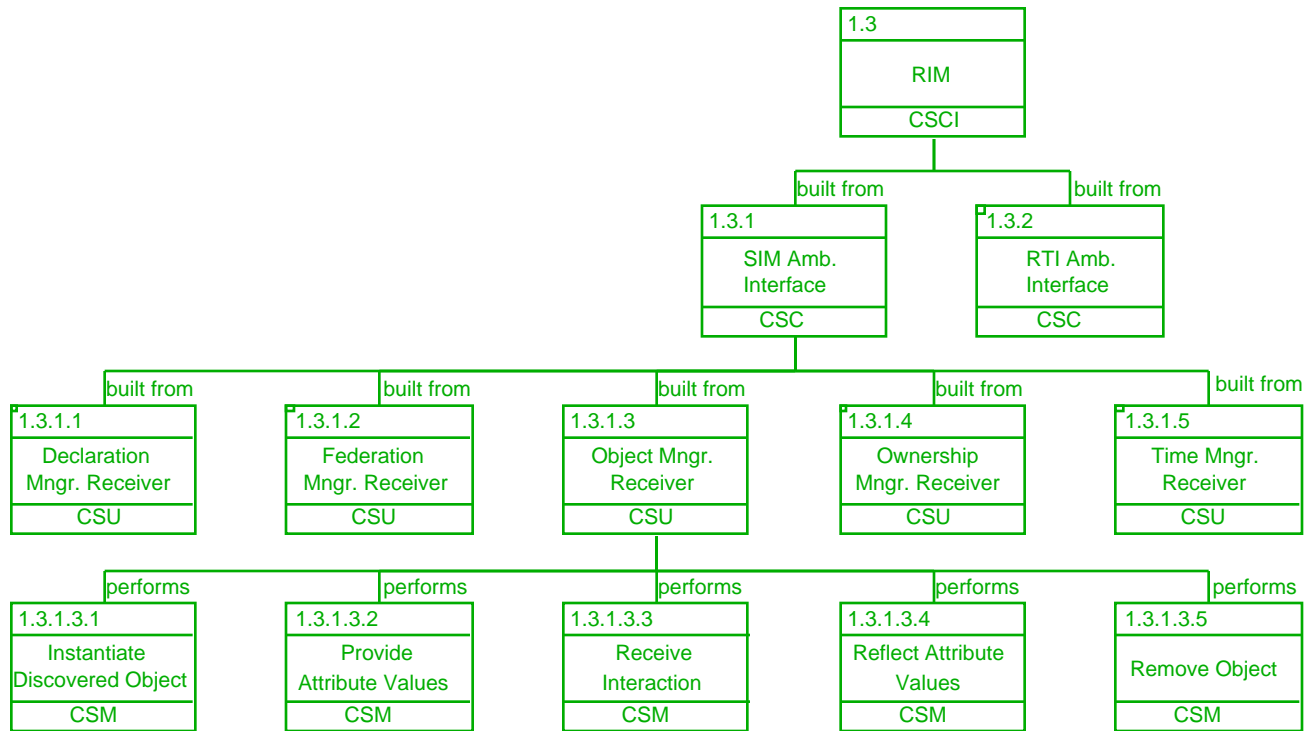
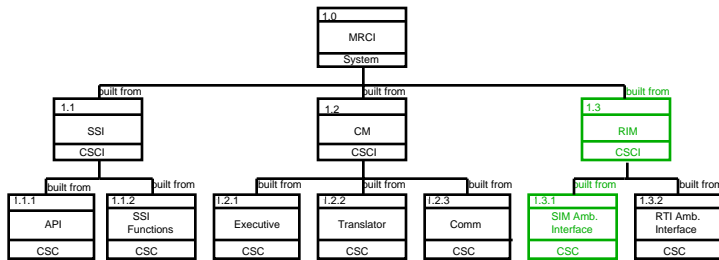
RIM Software Hierarchy (3 of 13)



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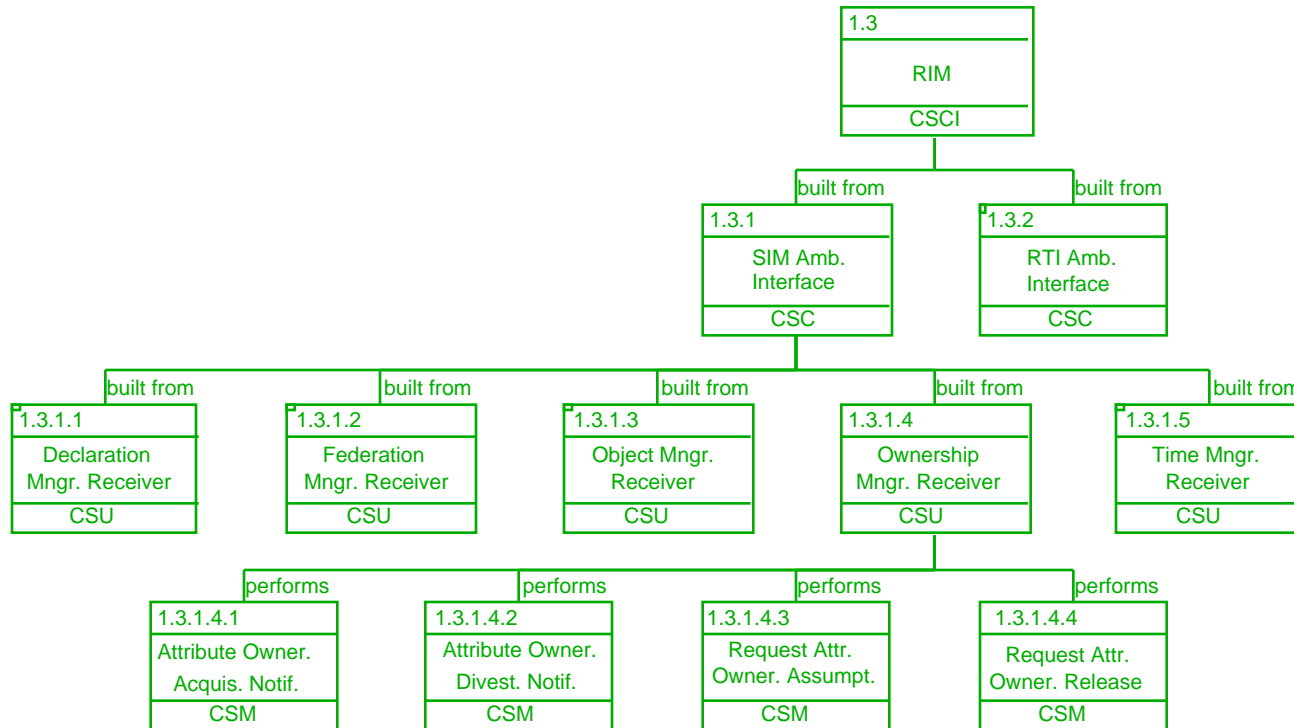
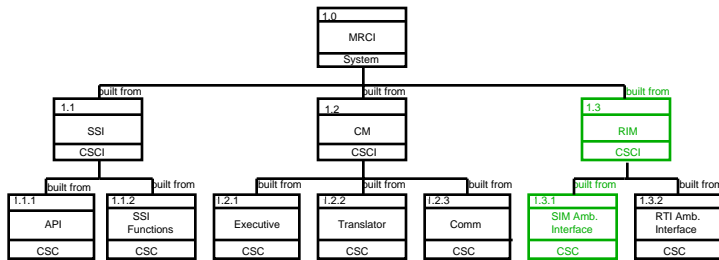
RIM Software Hierarchy (4 of 13)



MRCI Critical Design Review - 14 August, 1996



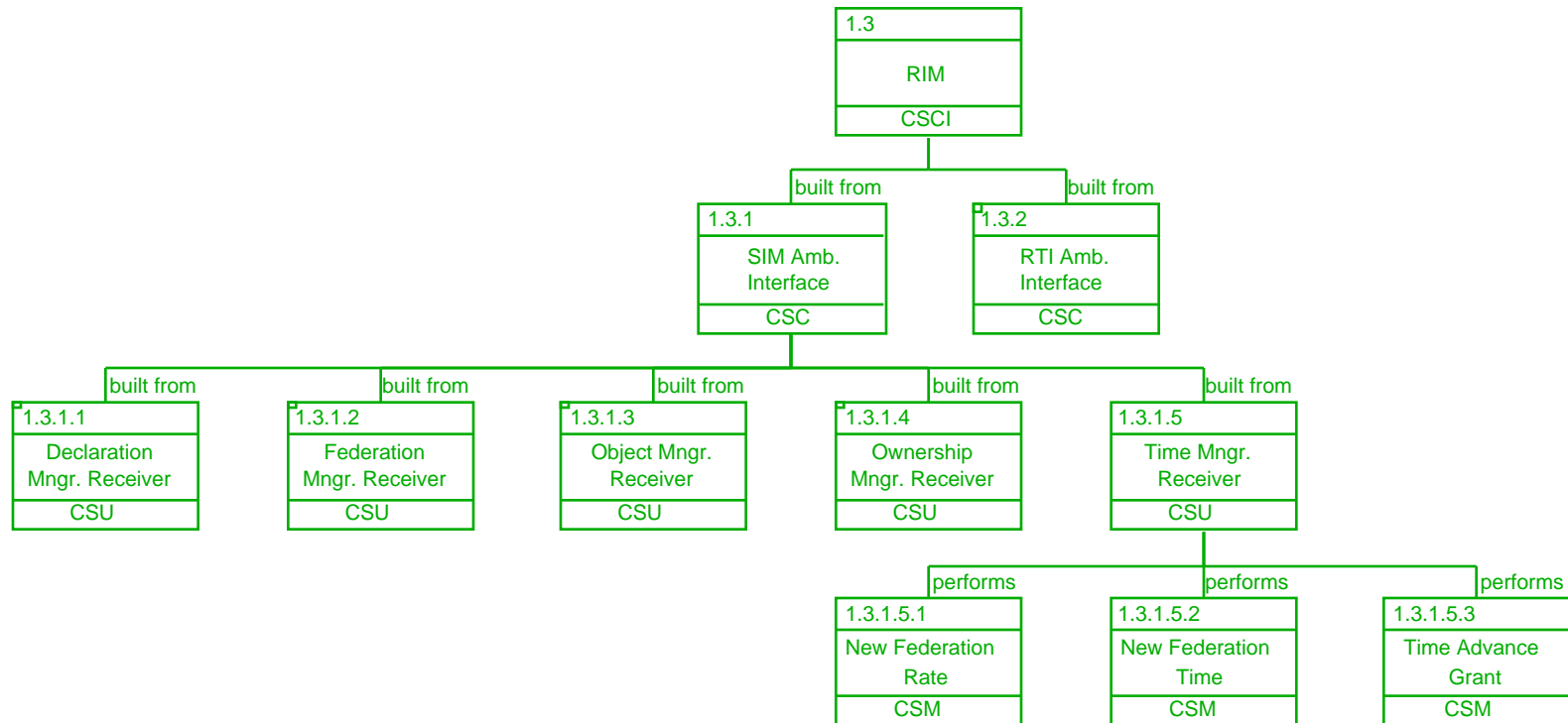
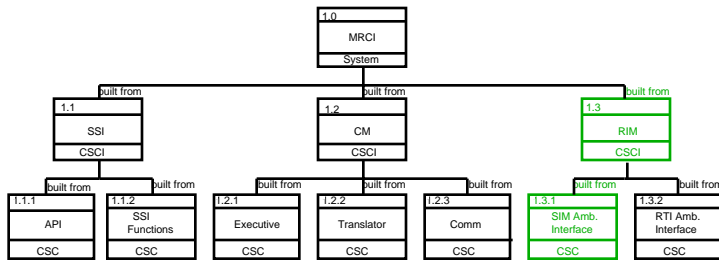
RIM Software Hierarchy (5 of 13)



MRCI Critical Design Review - 14 August, 1996



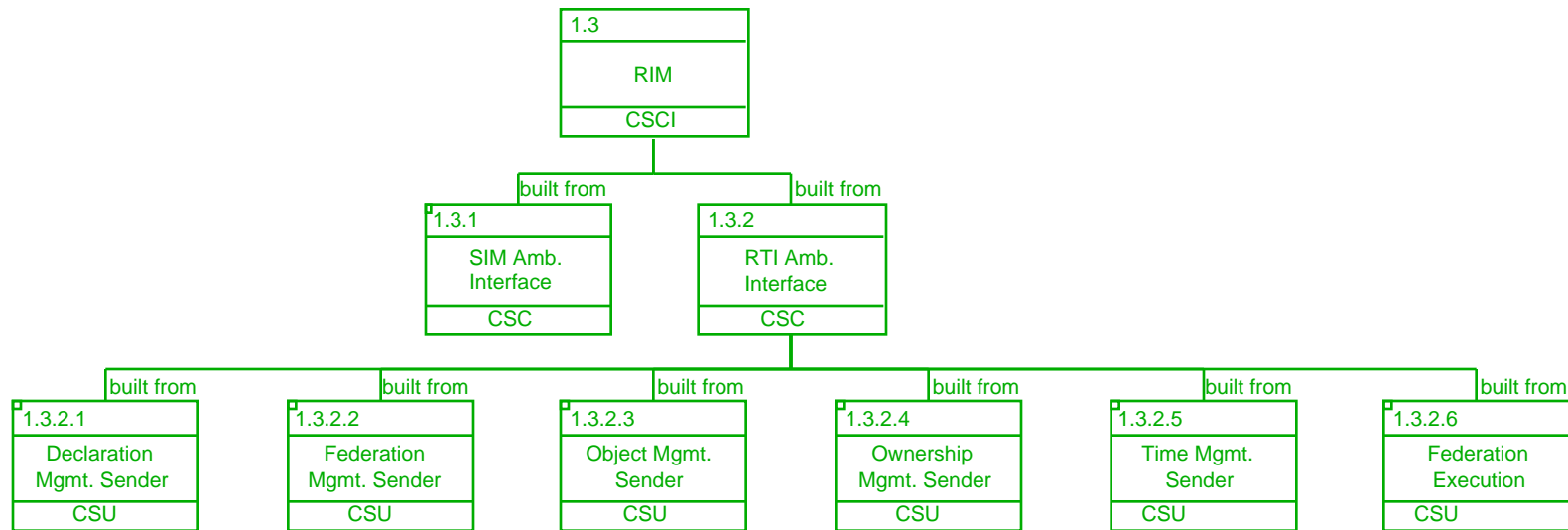
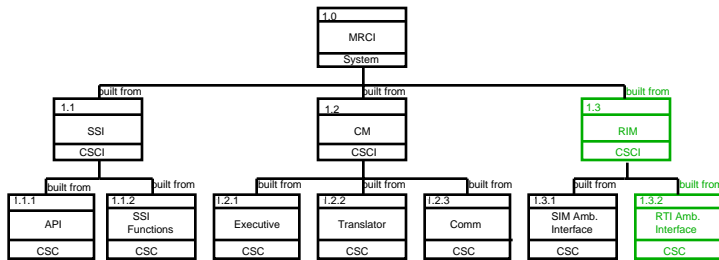
RIM Software Hierarchy (6 of 13)



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RIM Software Hierarchy (7 of 13)



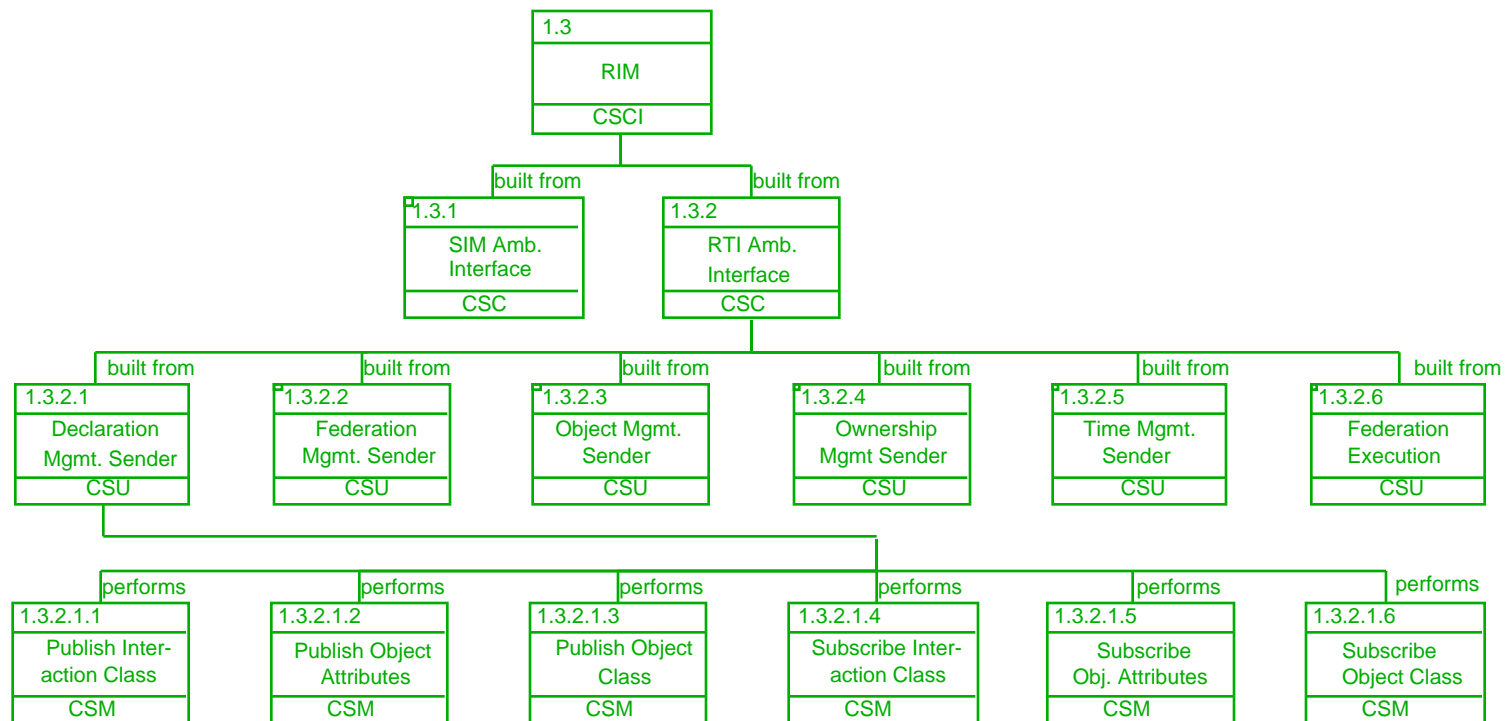
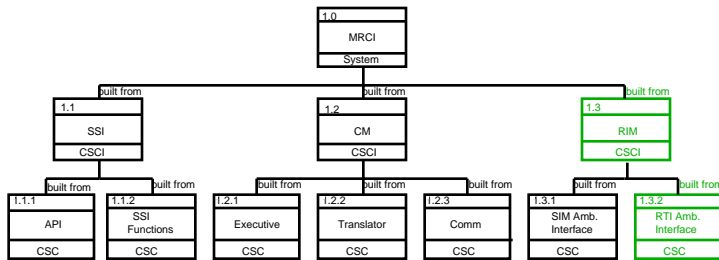
MRCI Critical Design Review - 14 August, 1996



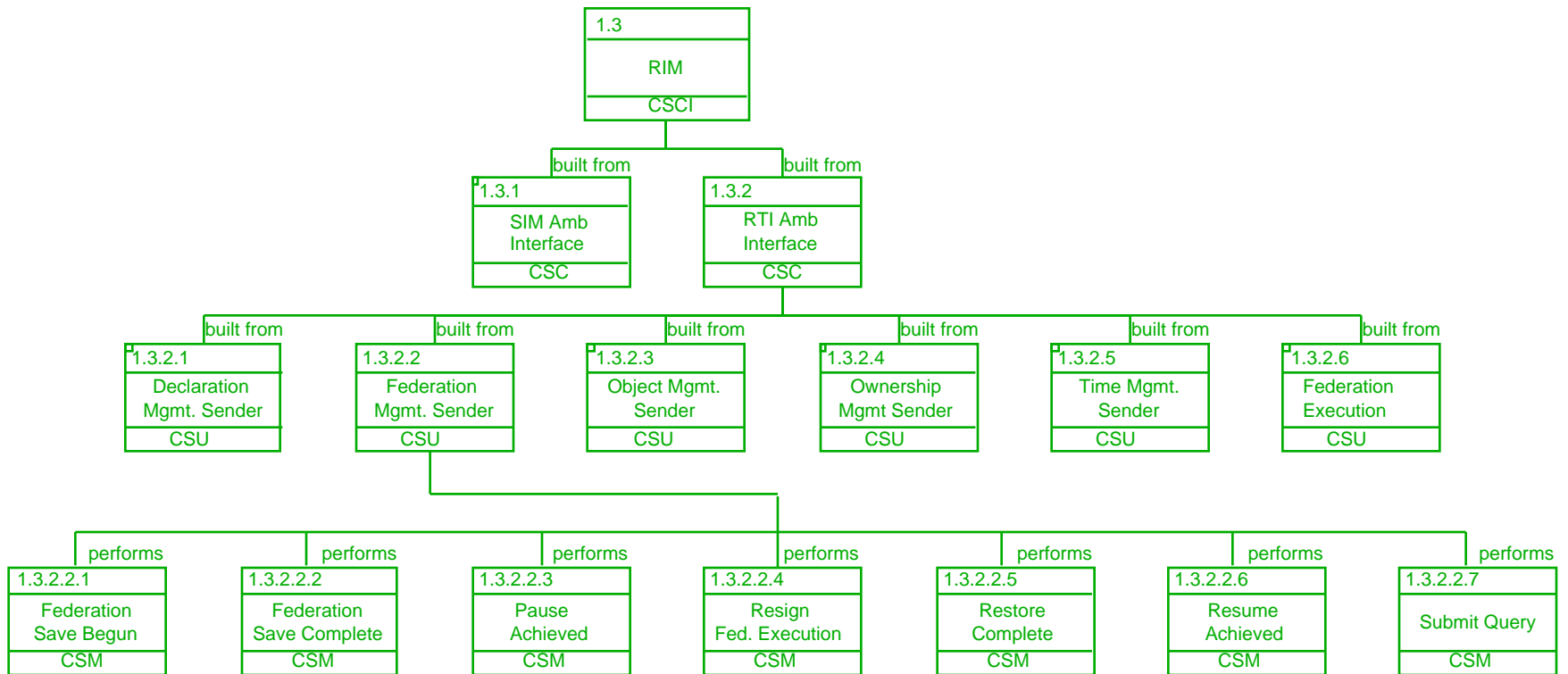
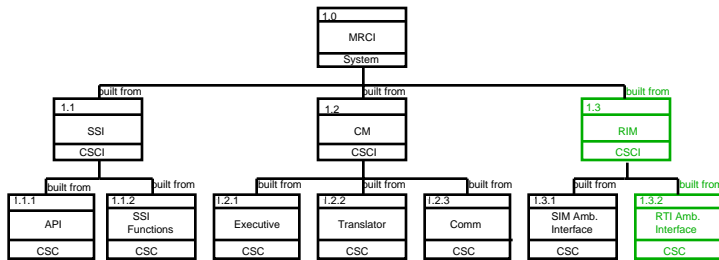
CSCI/CSC/CSU	Definition
Declaration Management Sender (1.3.2.1)	This component sends to the Declaration Manager.
Federation Management Sender (1.3.2.2)	This component sends to the Federation Manager.
Object Management Sender (1.3.2.3)	This component sends to the Object Manager.
Ownership Management Sender (1.3.2.4)	This component sends to the Ownership Manager.
Time Management Sender (1.3.2.5)	This component sends to the Time Manager.
Federation Execution (1.3.2.6)	This component executes all Federation related activities.



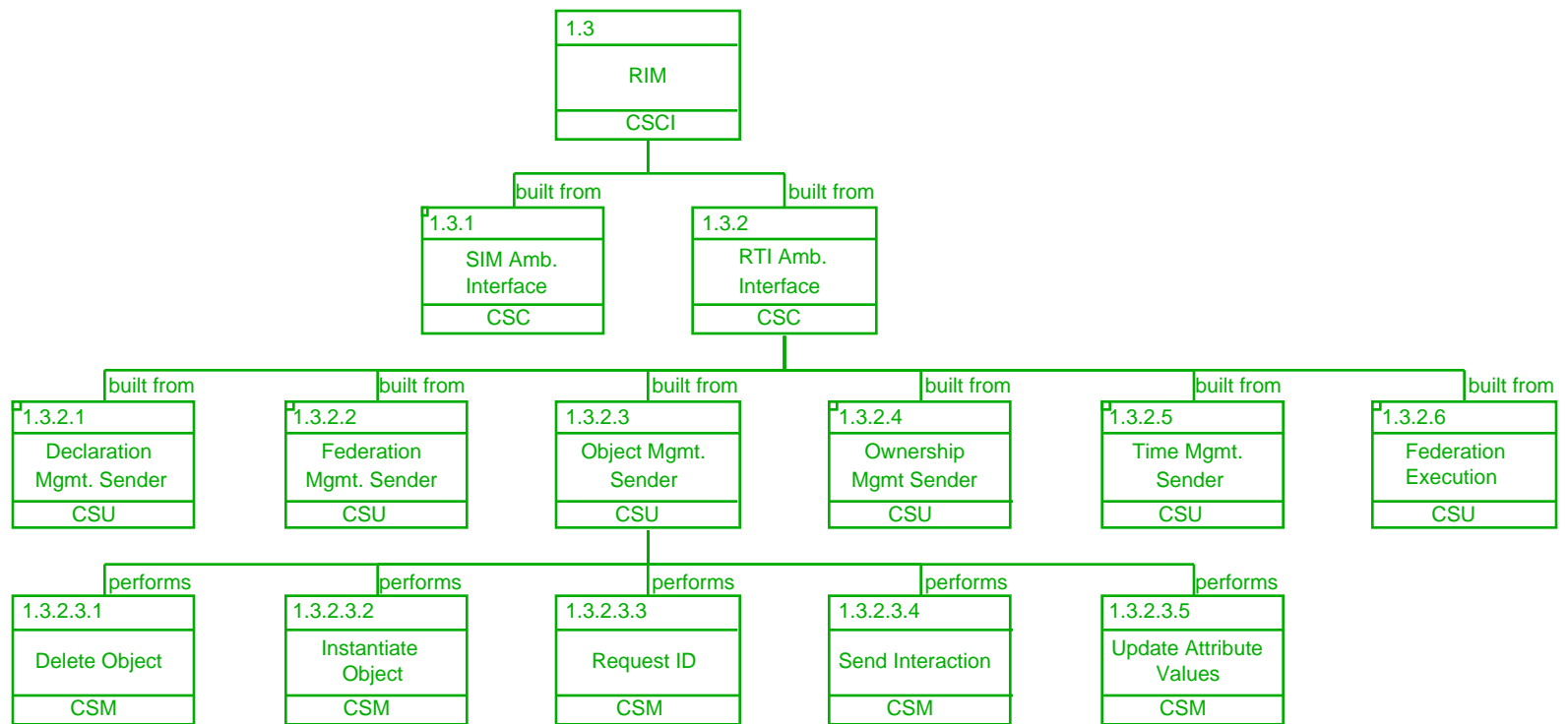
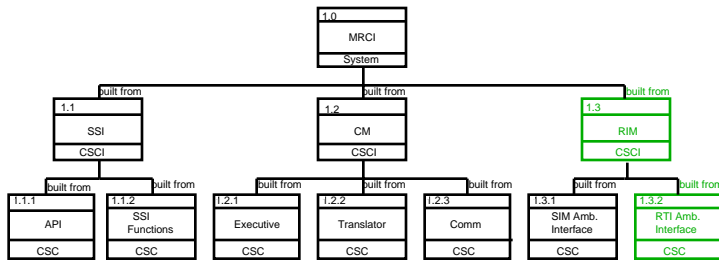
RIM Software Hierarchy (8 of 13)



RIM Software Hierarchy (9 of 13)



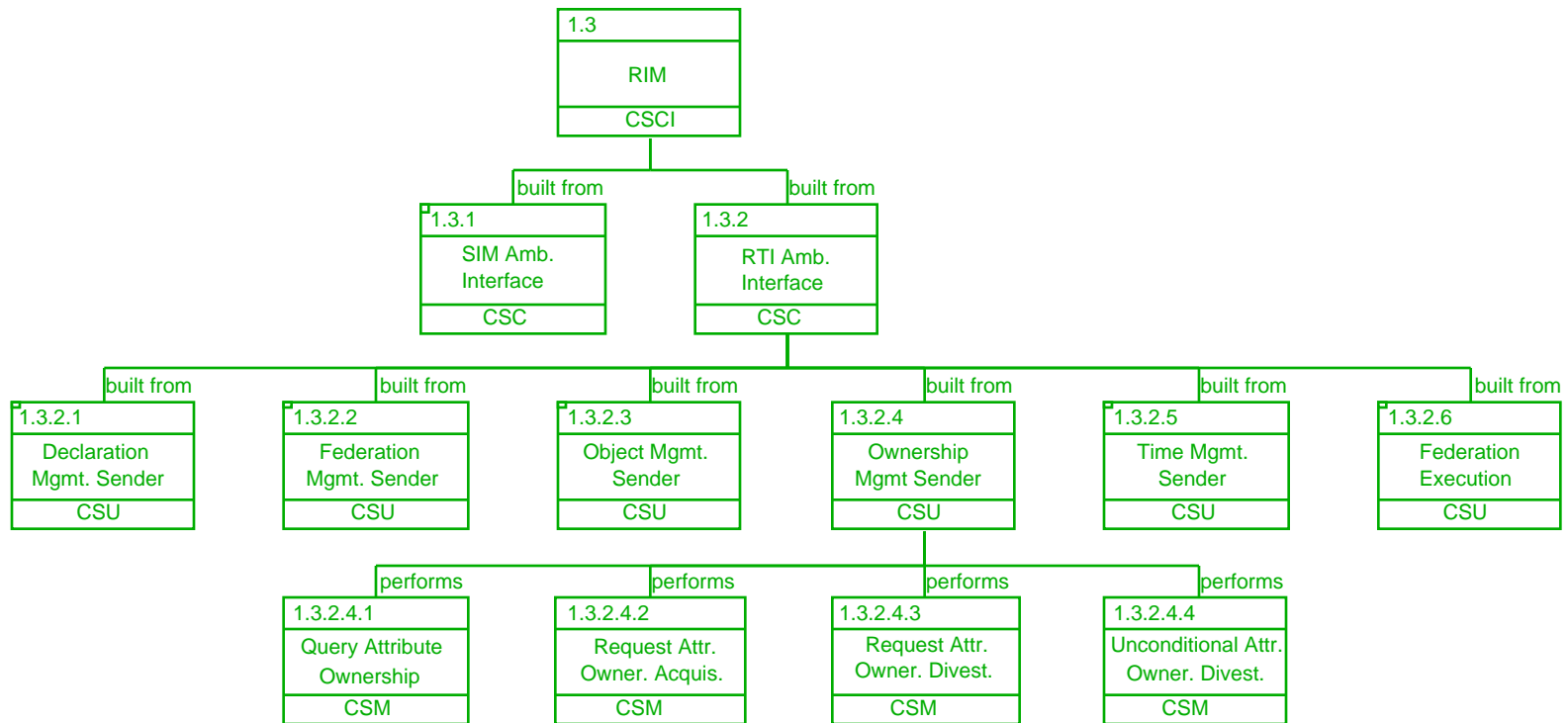
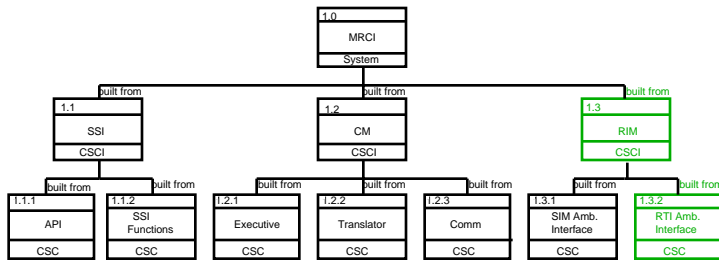
RIM Software Hierarchy (10 of 13)



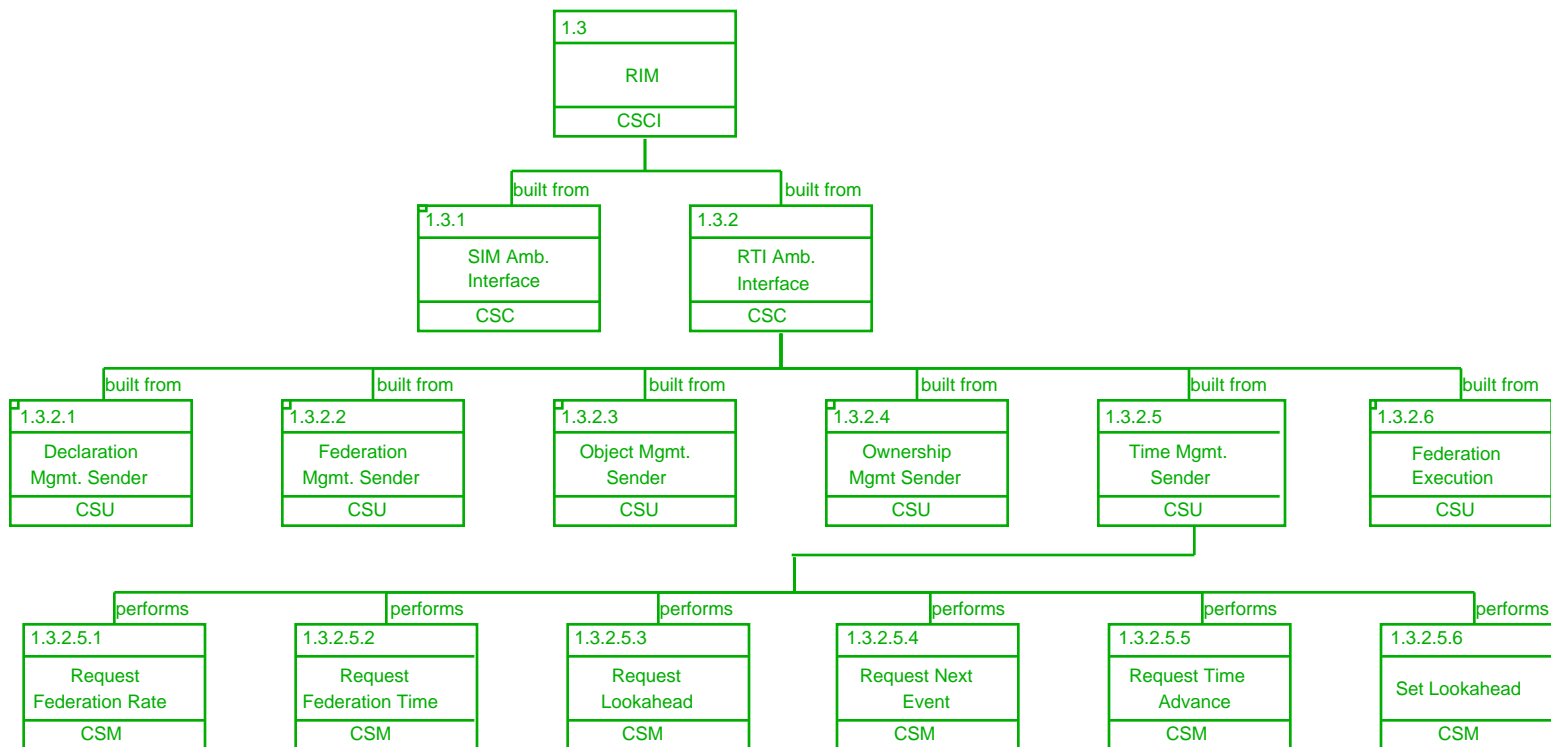
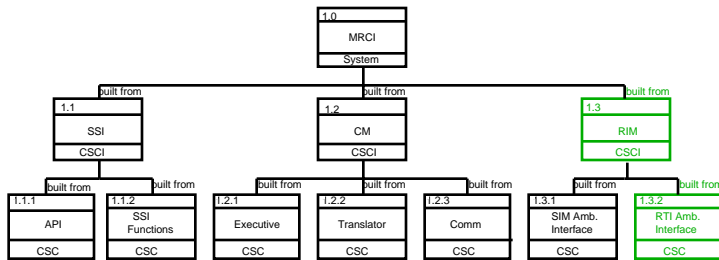
MRCI Critical Design Review - 14 August, 1996



RIM Software Hierarchy (11 of 13)



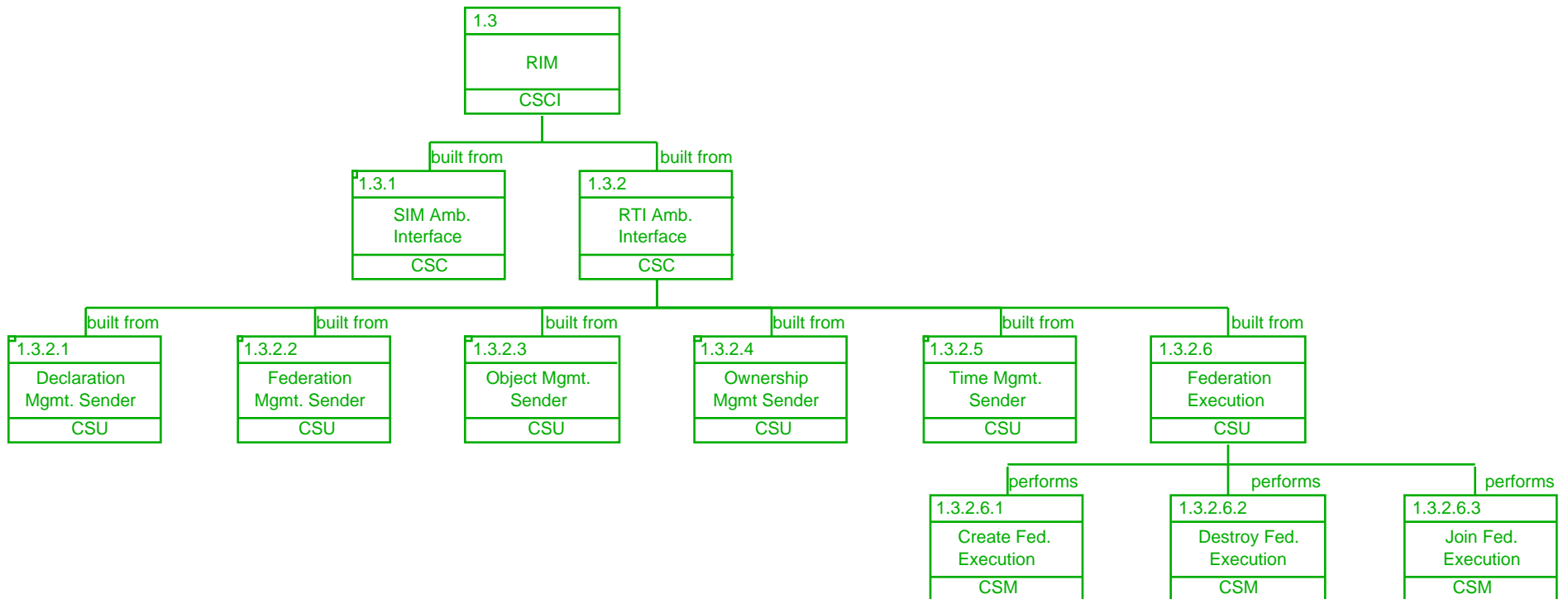
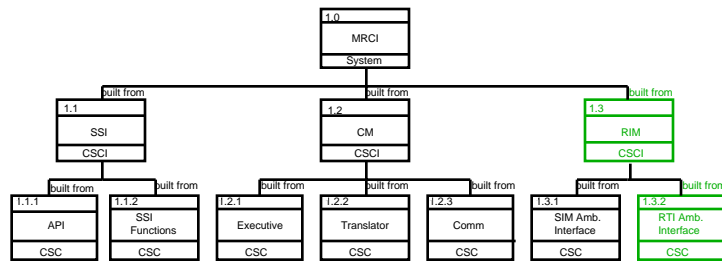
RIM Software Hierarchy (12 of 13)



MRCI Critical Design Review - 14 August, 1996



RIM Software Hierarchy (13 of 13)



MRCI Critical Design Review - 14 August, 1996



MRCI CDR Agenda (1 of 2)

0800-0815 Welcome & MRCI Introduction

0815-0830 CDR Overview & Purpose

0830-1430 MRCI Design

*0830-0900 Identification of MRCI Software Configuration Items,
Components & Units*

*0900-1000 Definition of MRCI Software Configuration Items,
Components & Units*

➡ *1000-1015 Break*

*1015-1115 Block Diagrams of CSCI's, CSC's, CSU's components and
relationships*

1115-1130 Program library to contain each CSCI

1130-1215 Lunch



MRCI Critical Design Review - 14 August, 1996



MRCI CDR Agenda (1 of 2)

0800-0815 Welcome & MRCI Introduction

0815-0830 CDR Overview & Purpose

0830-1430 MRCI Design

*0830-0900 Identification of MRCI Software Configuration Items,
Components & Units*

*0900-1000 Definition of MRCI Software Configuration Items,
Components & Units*

1000-1015 Break

➡ *1015-1115 Block Diagrams of CSCI's, CSC's, CSU's components and
relationships*

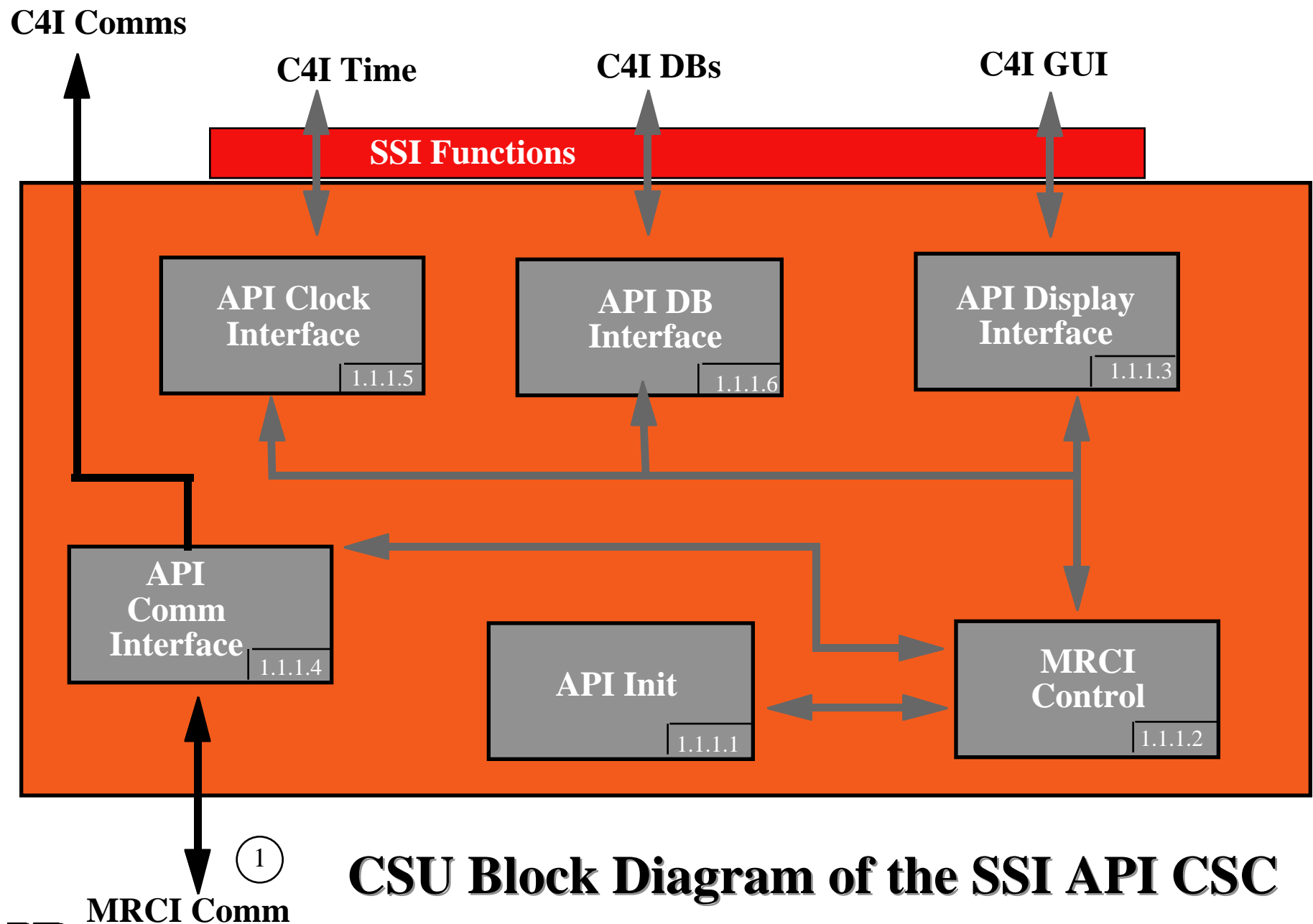
1115-1130 Program library to contain each CSCI

1130-1215 Lunch



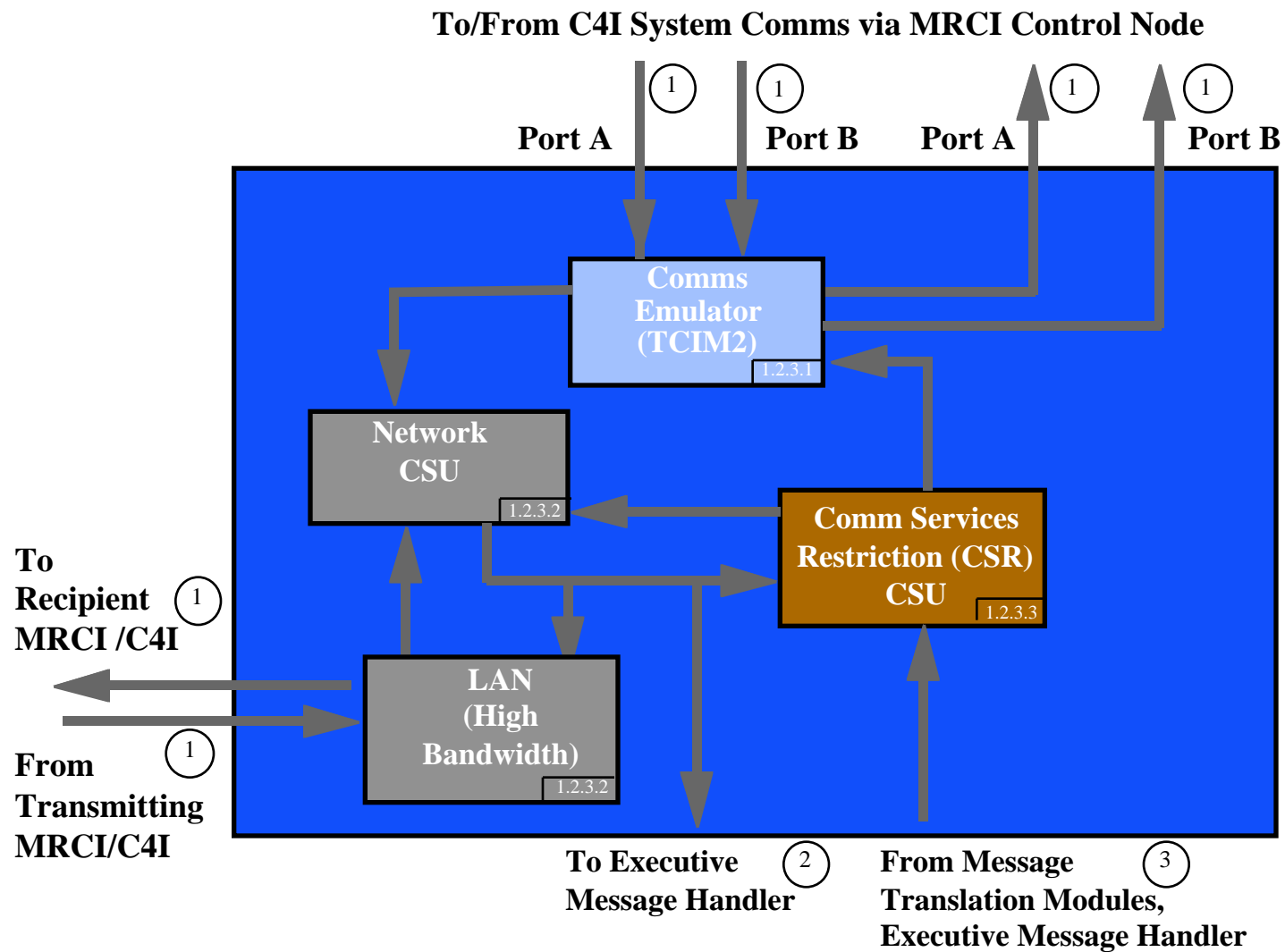
MRCI Critical Design Review - 14 August, 1996





MRCI Critical Design Review - 14 August, 1996





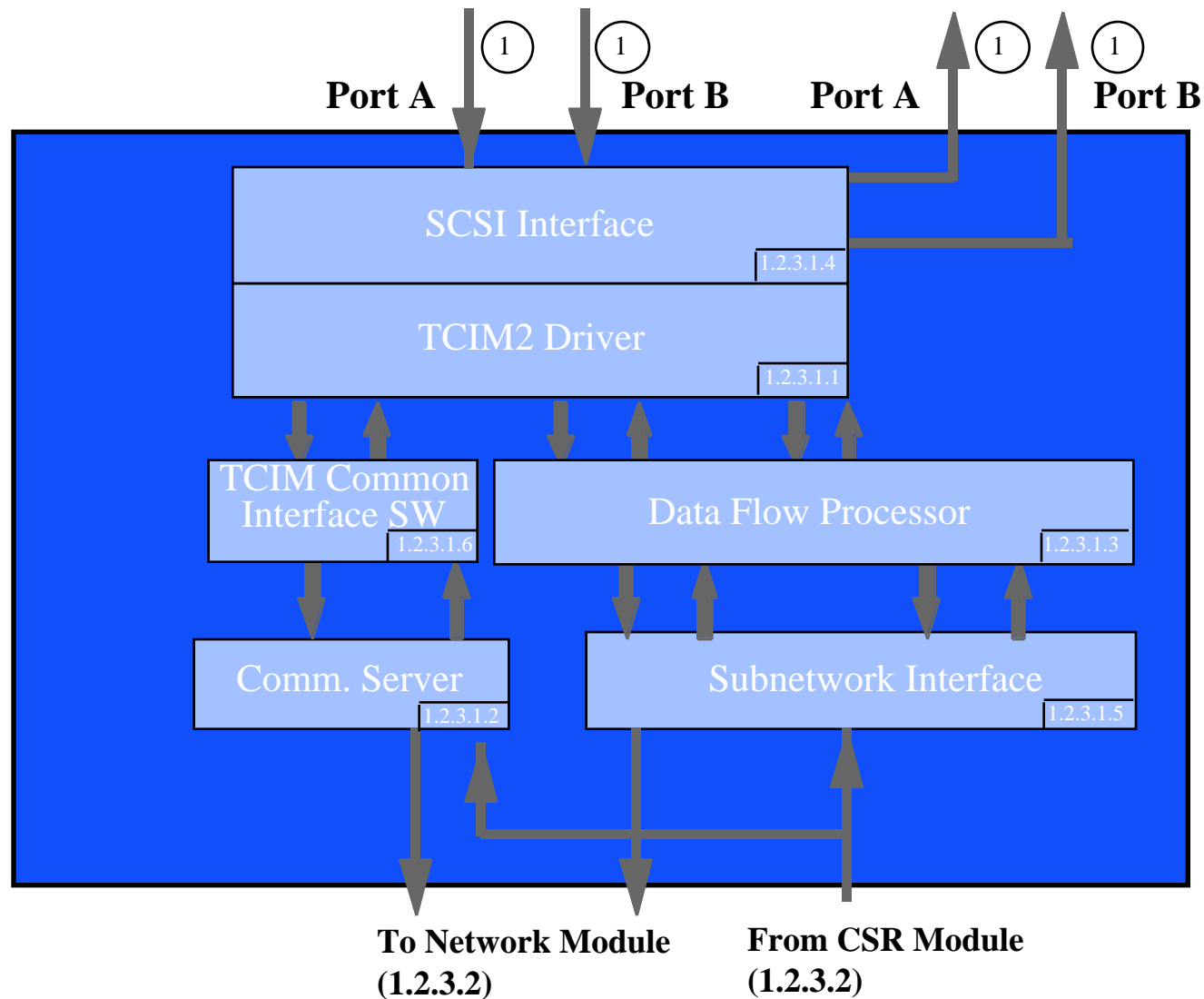
CSU Block Diagram of the CM COMM CSC



MRCI Critical Design Review - 14 August, 1996



From/To C4I System Comms via MRCI Control Node

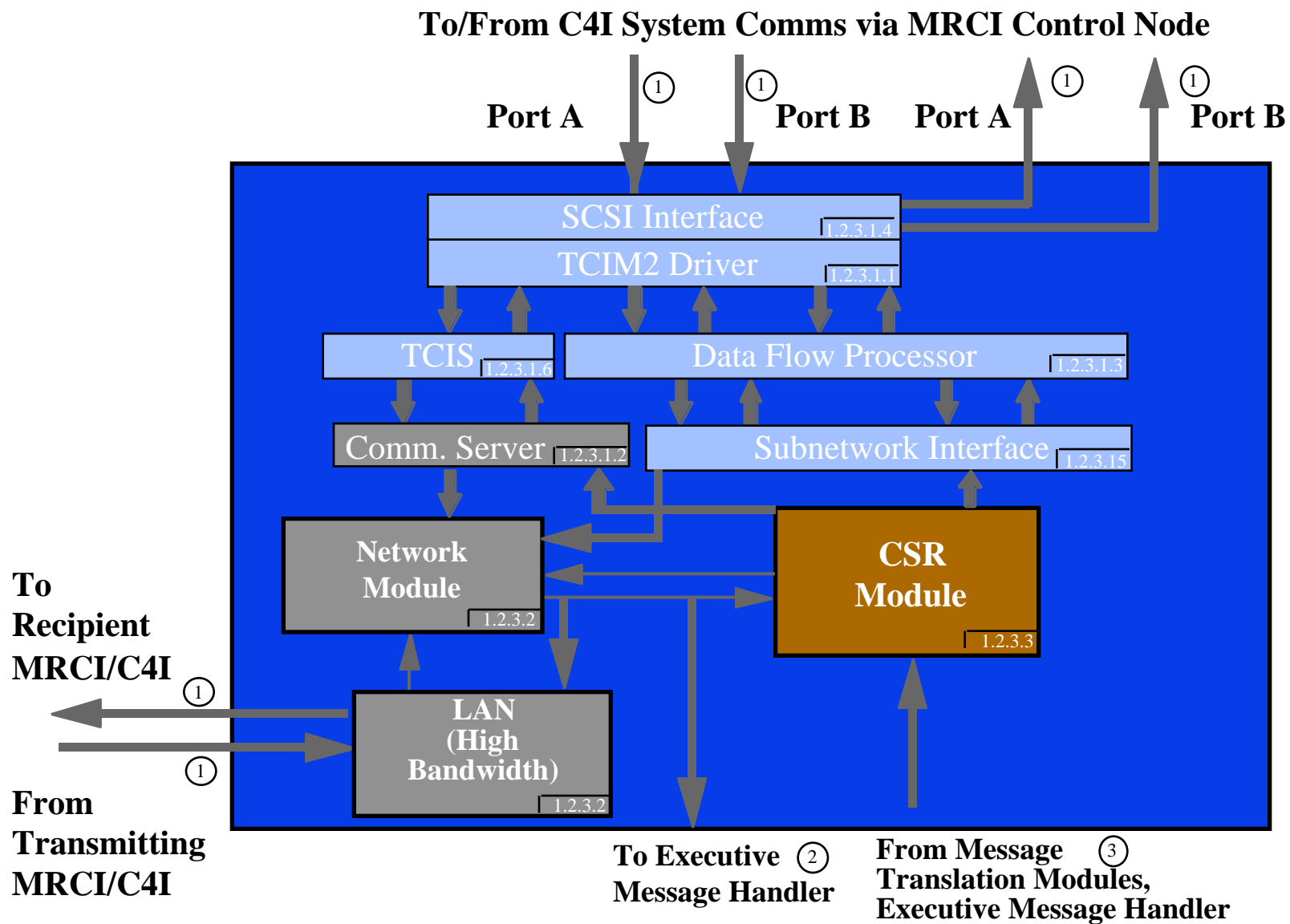


Comms Emulator (TCIM2 Module) (1.2.3.1)



MRCI Critical Design Review - 14 August, 1996



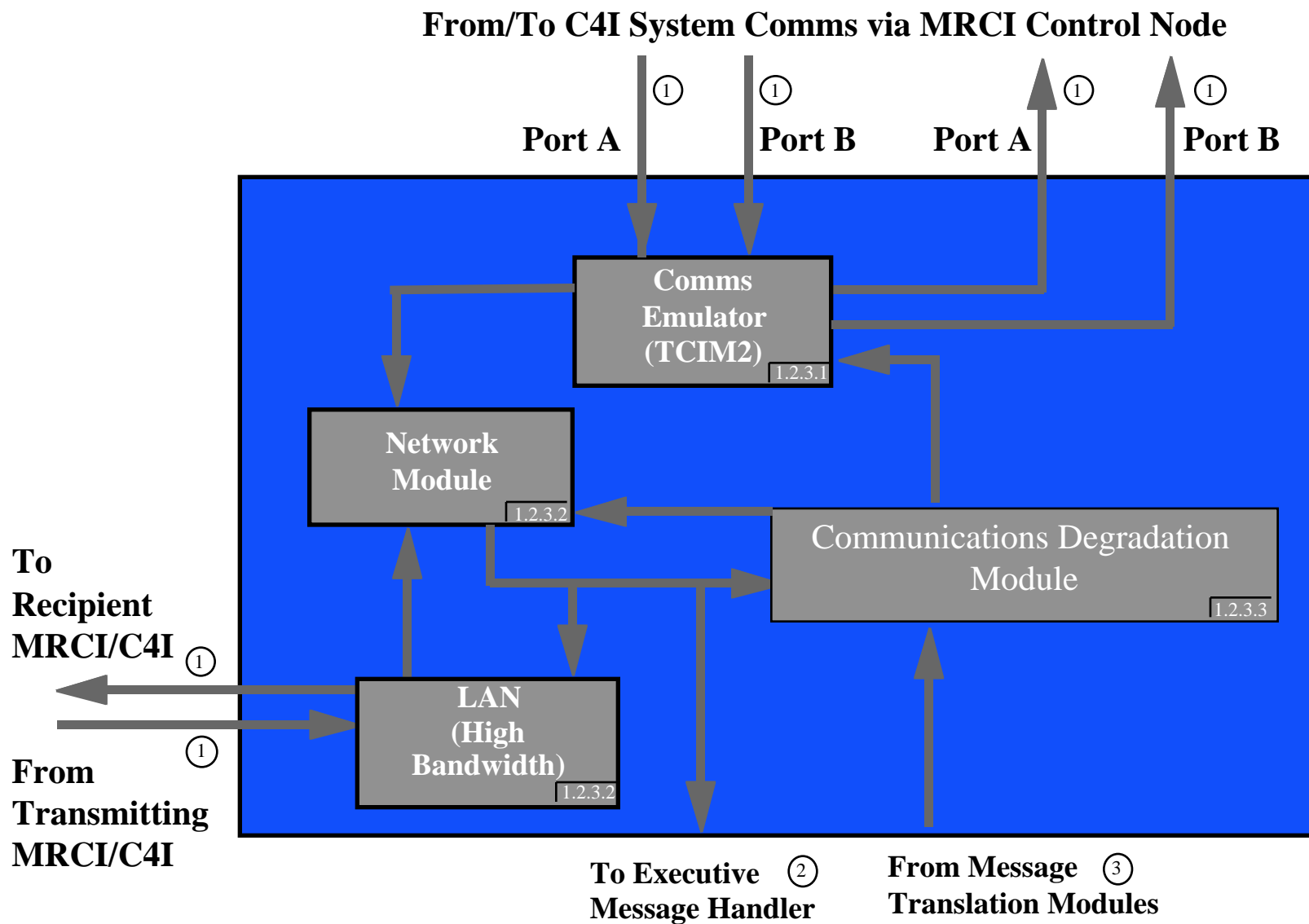


TCIM2 Communication Interface



MRCI Critical Design Review - 14 August, 1996



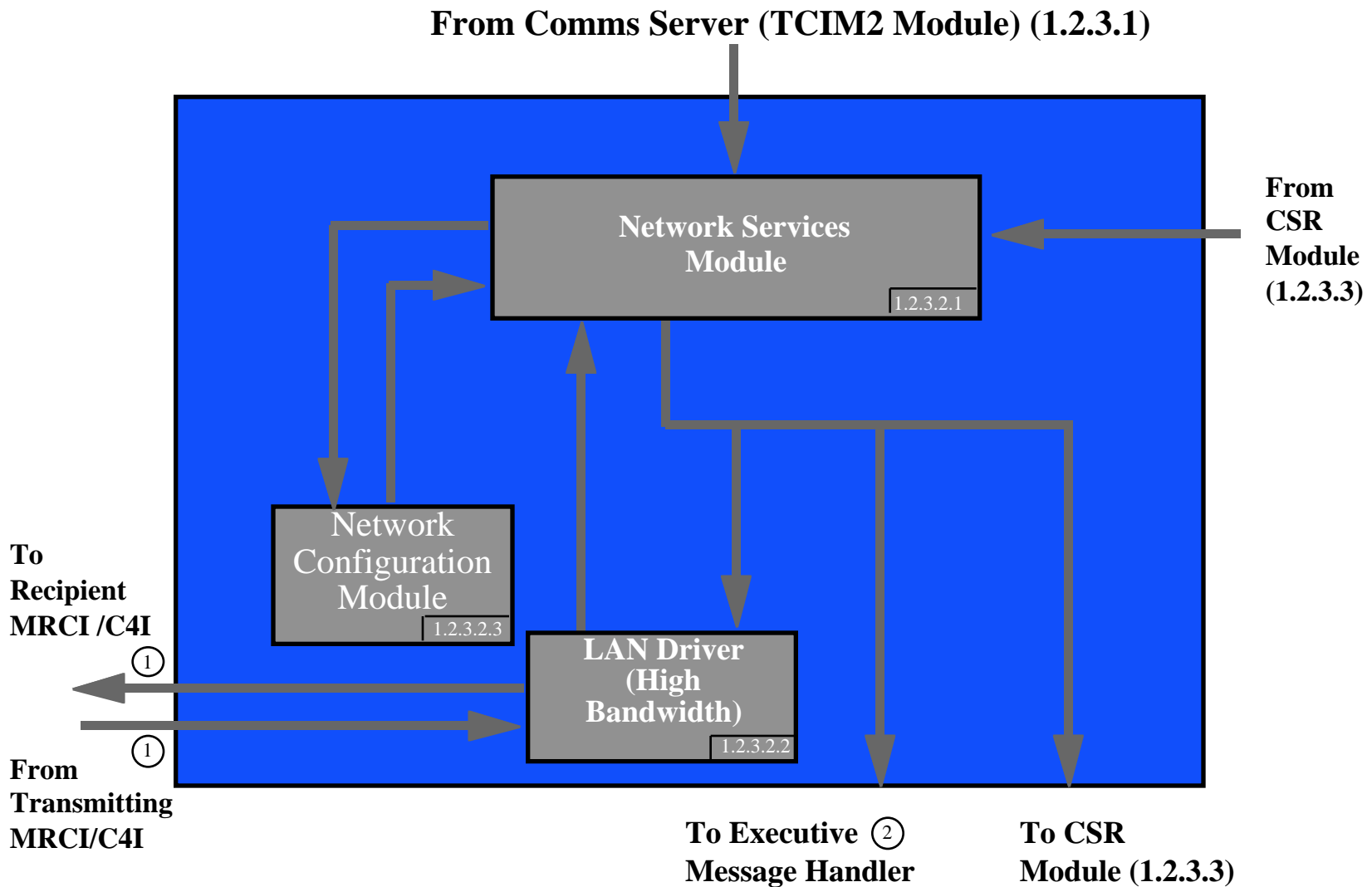


CSR Communication Interface



MRCI Critical Design Review - 14 August, 1996





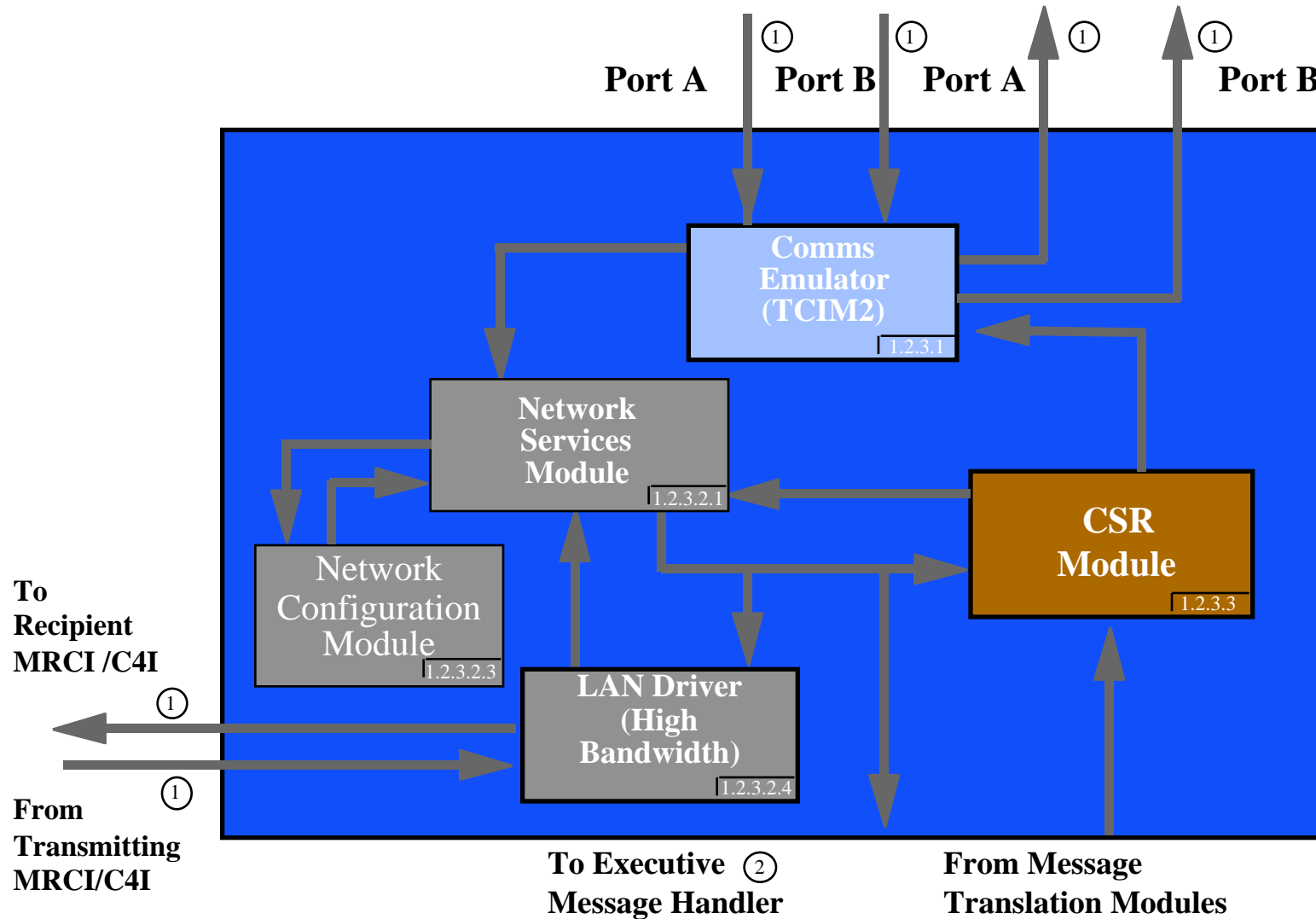
Network Module (1.2.3.2)



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From/To C4I System Comms via MRCI Control Node



Network Communication Interface

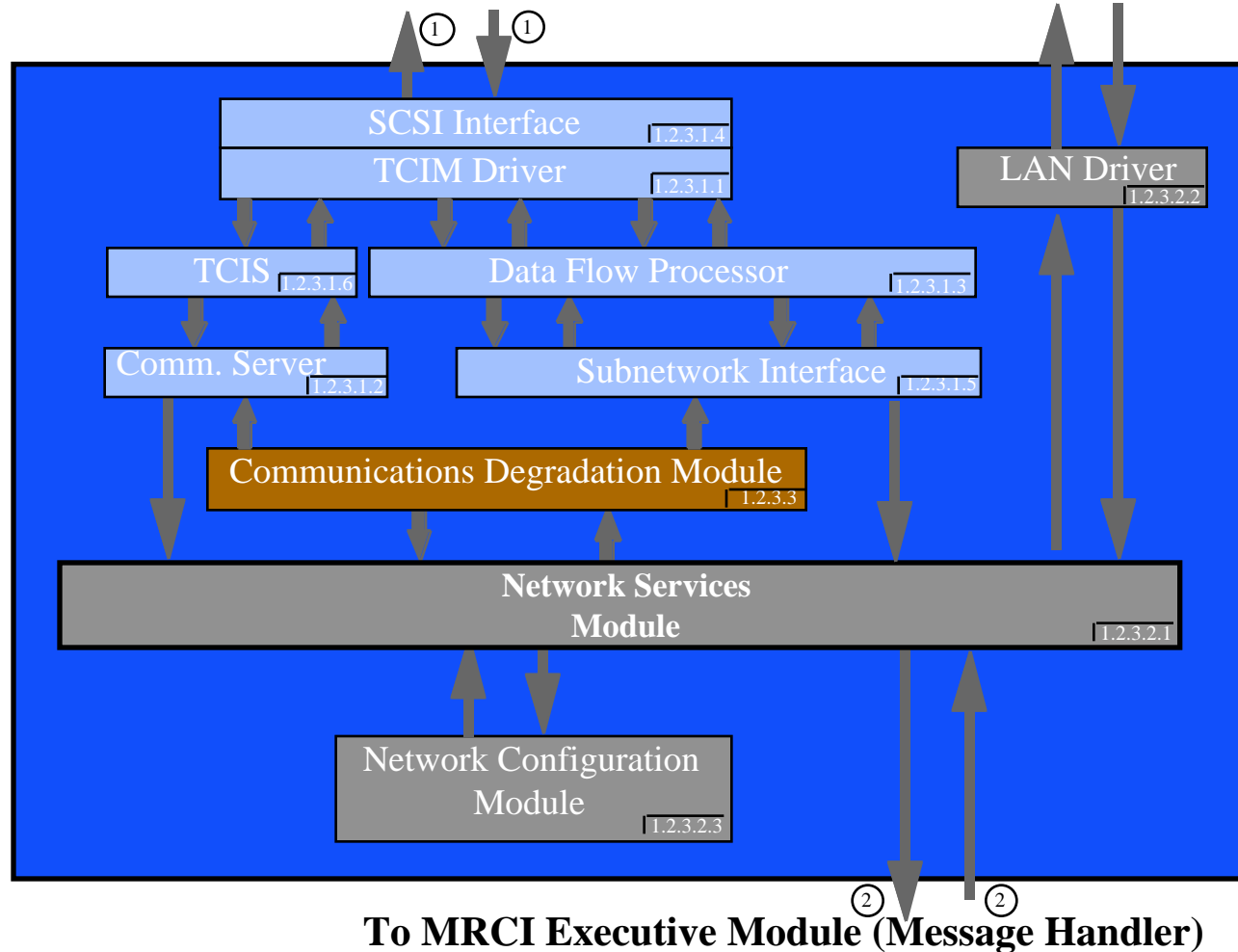


MRCI Critical Design Review - 14 August, 1996



To/From C4I System Comms via MRCI Control Node

To/From RTI/MRCI/C4I Recipient

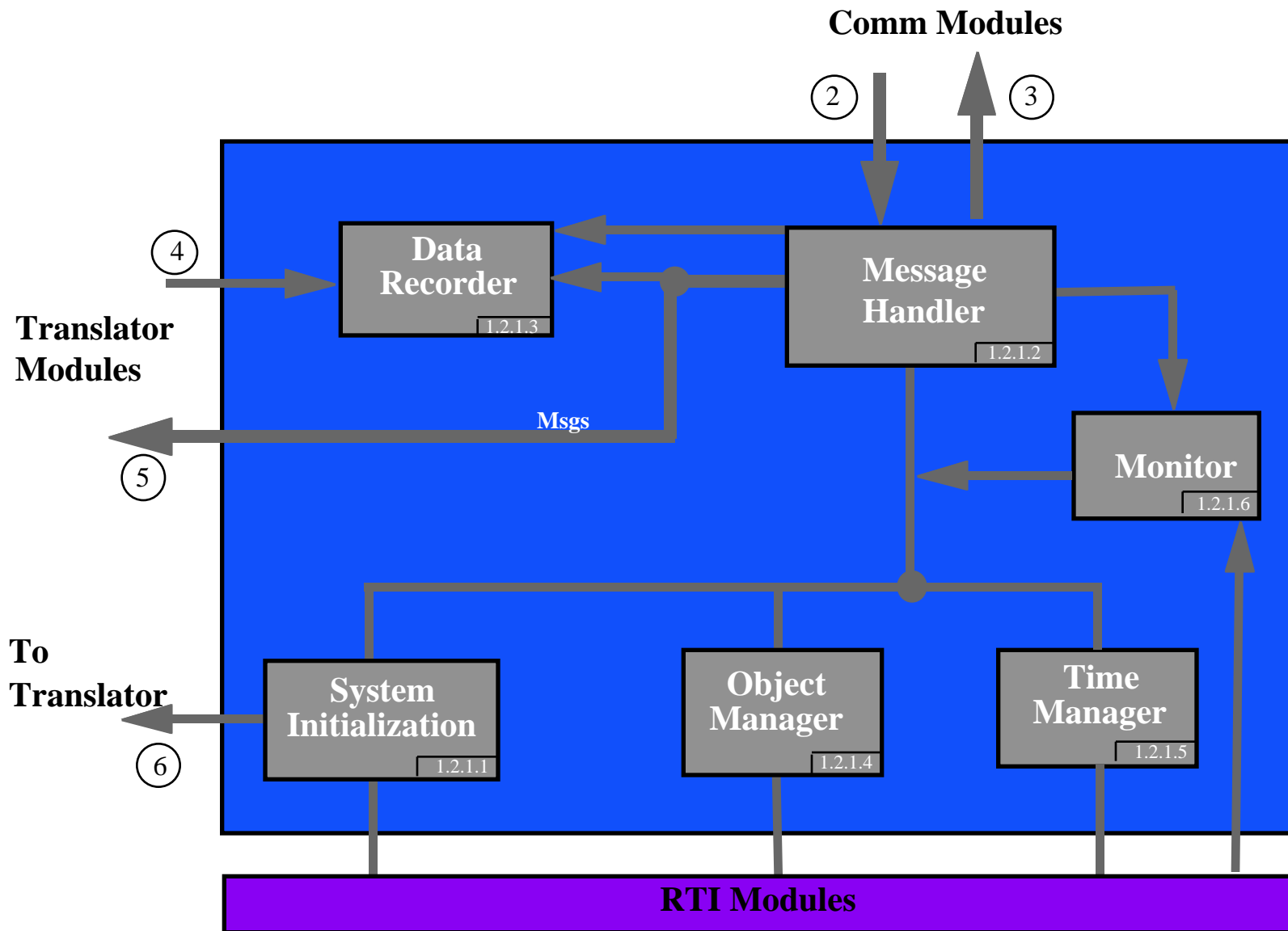


Communications Software Components



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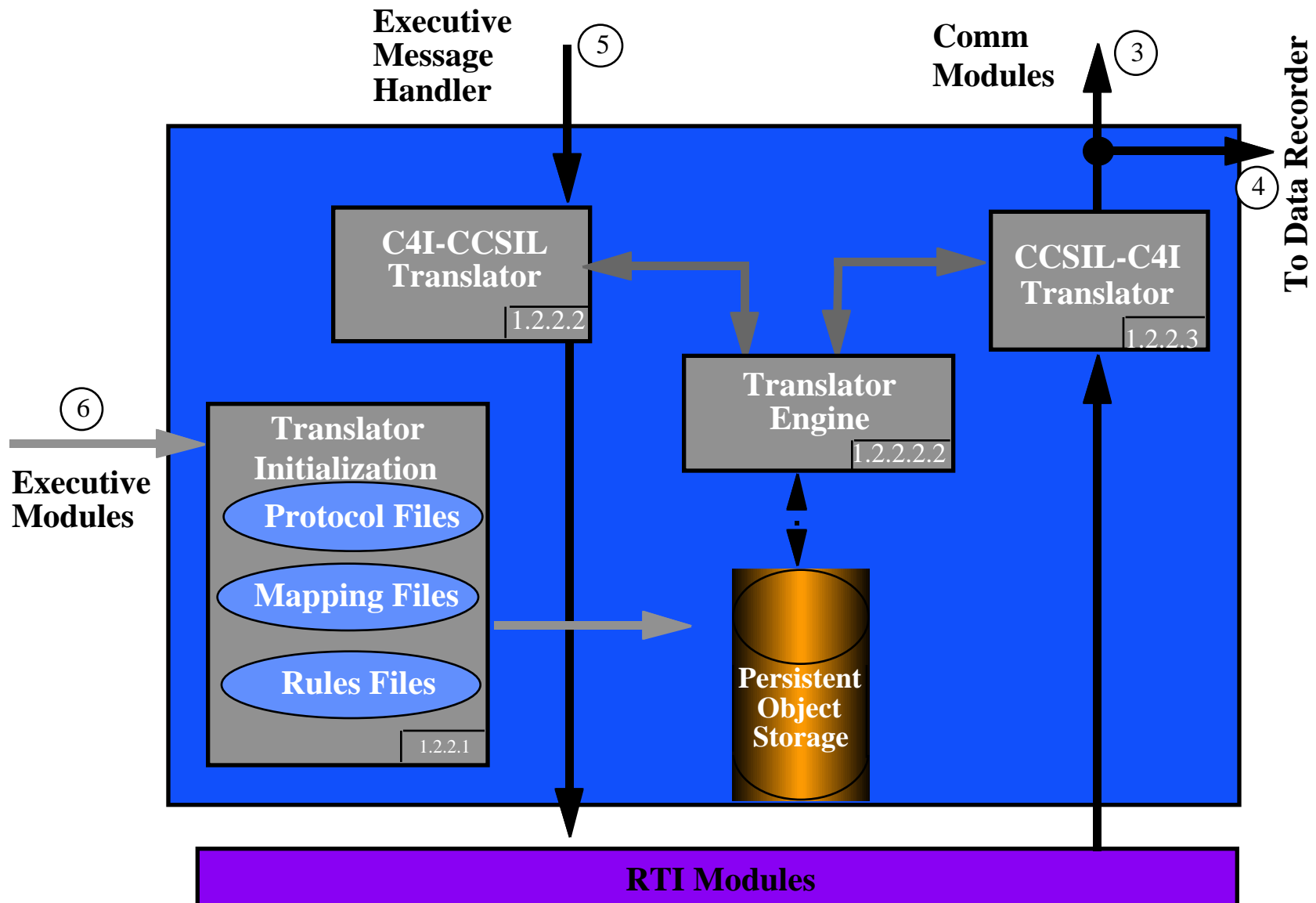


CSU Block Diagram of the CM EXEC CSC



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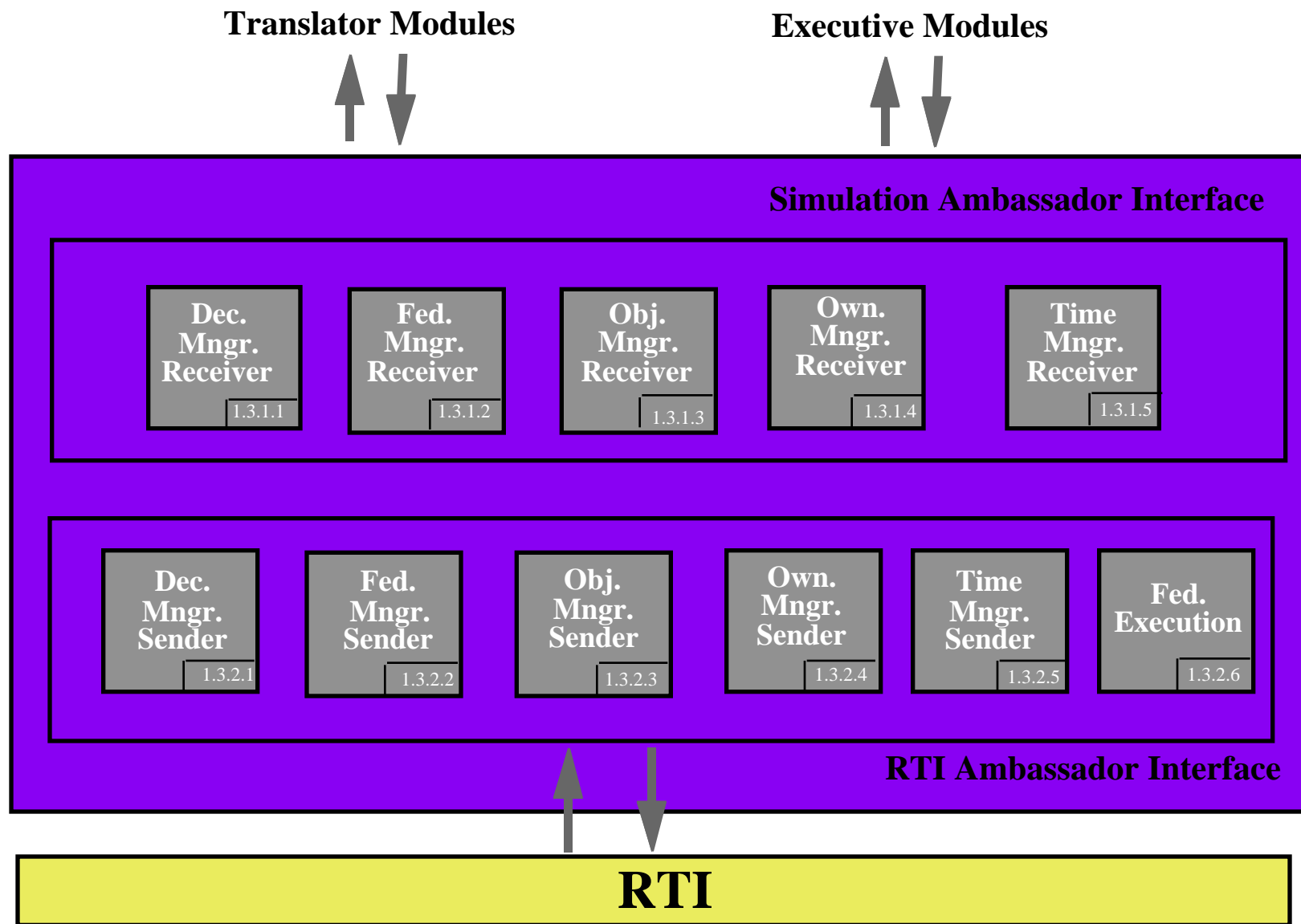


CSU Block Diagram of the CM TRANSLATOR CSC



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CSU Block Diagram of the RIM SIMAMB and RTIAMB CSC's

MRCI CDR Agenda (1 of 2)

0800-0815 Welcome & MRCI Introduction

0815-0830 CDR Overview & Purpose

0830-1430 MRCI Design

*0830-0900 Identification of MRCI Software Configuration Items,
Components & Units*

*0900-1000 Definition of MRCI Software Configuration Items,
Components & Units*

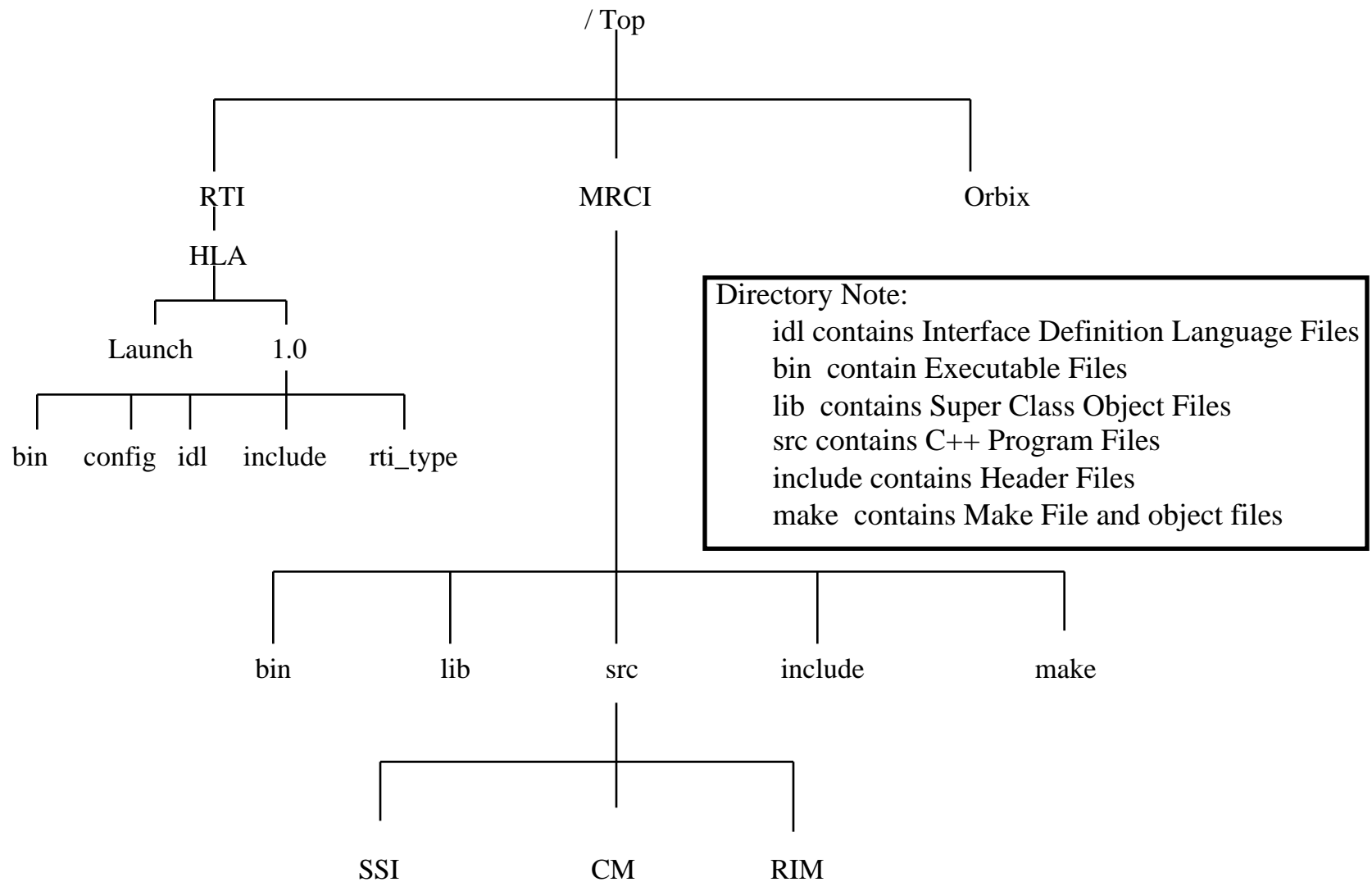
1000-1015 Break

*1015-1115 Block Diagrams of CSCI's, CSC's, CSU's components and
relationships*

➡ *1115-1130 Program library to contain each CSCI*

1130-1215 Lunch





MRCI File Directory Hierarchy



MRCI Critical Design Review - 14 August, 1996



MRCI CDR Agenda (1 of 2)

0800-0815 Welcome & MRCI Introduction

0815-0830 CDR Overview & Purpose

0830-1430 MRCI Design

*0830-0900 Identification of MRCI Software Configuration Items,
Components & Units*

*0900-1000 Definition of MRCI Software Configuration Items,
Components & Units*

1000-1015 Break

*1015-1115 Block Diagrams of CSCI's, CSC's, CSU's components and
relationships*

1115-1130 Program library to contain each CSCI

 *1130-1215 Lunch*



MRCI Critical Design Review - 14 August, 1996



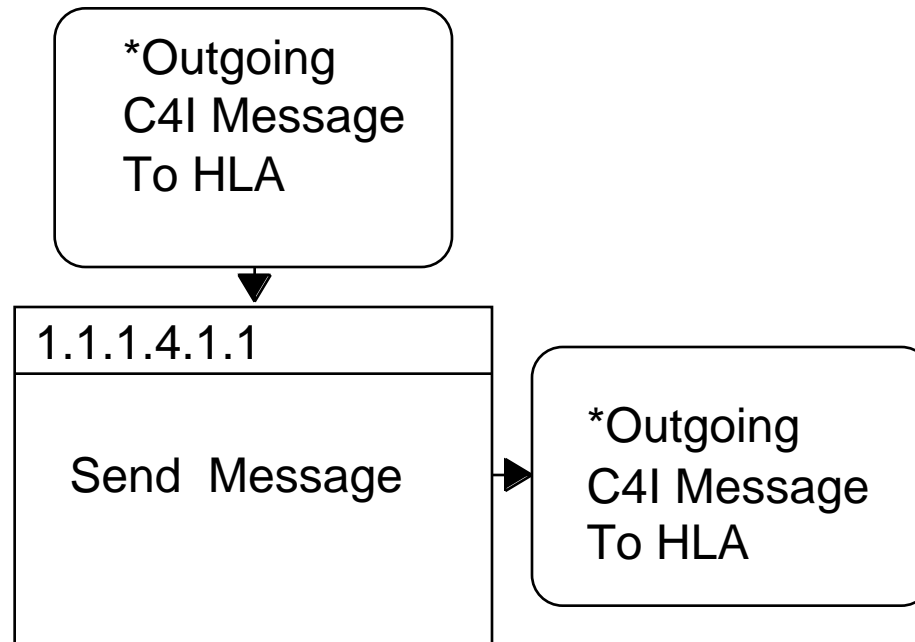
An Employee-Owned Company

MRCI CDR Agenda (2 of 2)

☛	1215-1345	<i>System Specific Interface Design</i> <i>Common Modules Interface Designs (to SSI & RIM)</i> <i>RTI Interface Module (RIM) Design</i>
	1345-1400	<i>CSCI, CSC, CSU Development Status (i.e. existing or new development)</i>
	1400-1415	<i>Requirements Traceability to SRR</i>
	1415-1500	<i>Summary & Wrap Up</i>



C4I System - to - HLA Federation N² Interface Design Depiction (1 of 5)



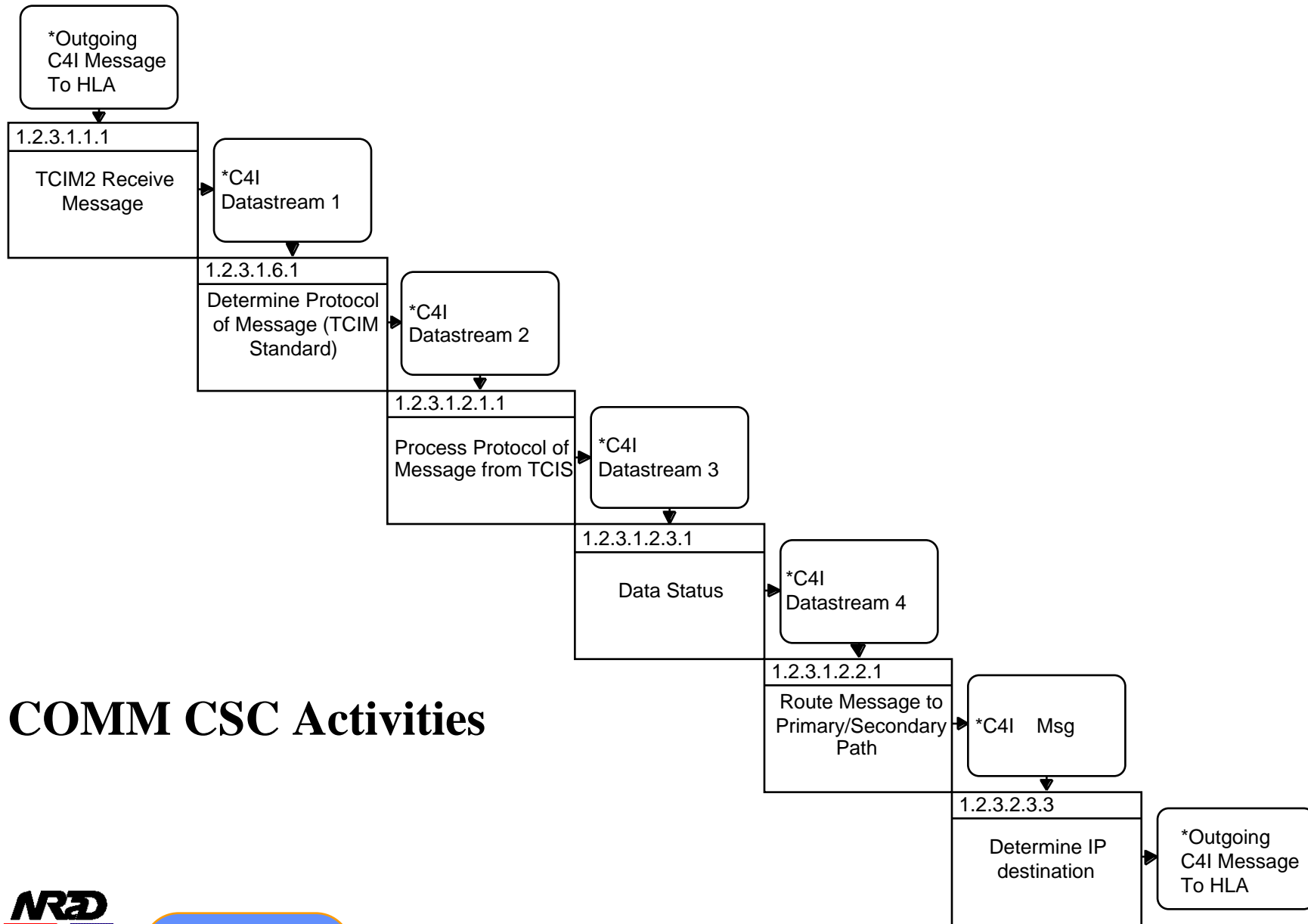
API CSC Activities



MRCI Critical Design Review - 14 August, 1996



C4I System - to - HLA Federation N² Interface Design Depiction (2 of 5)



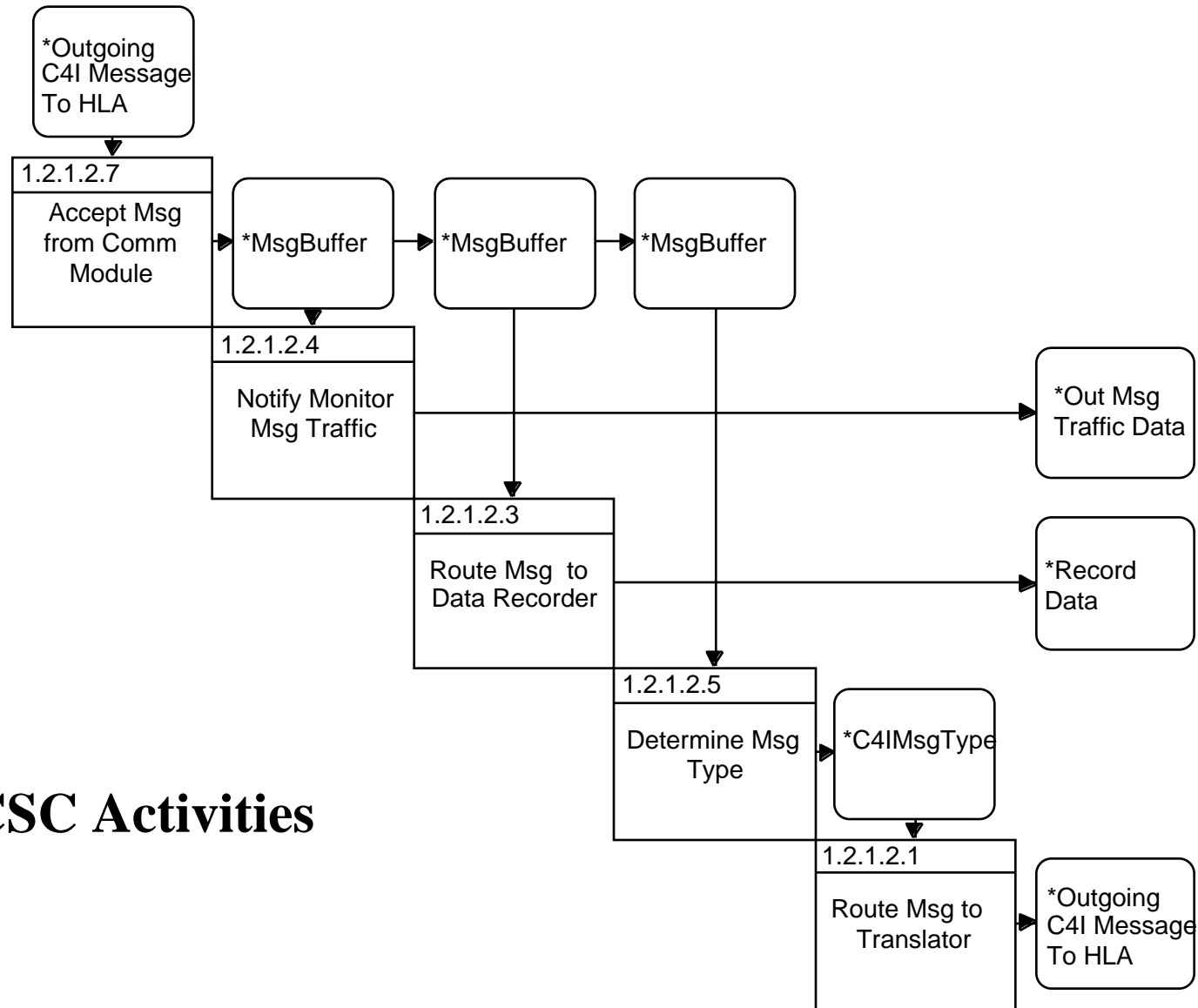
COMM CSC Activities



MRCI Critical Design Review - 14 August, 1996



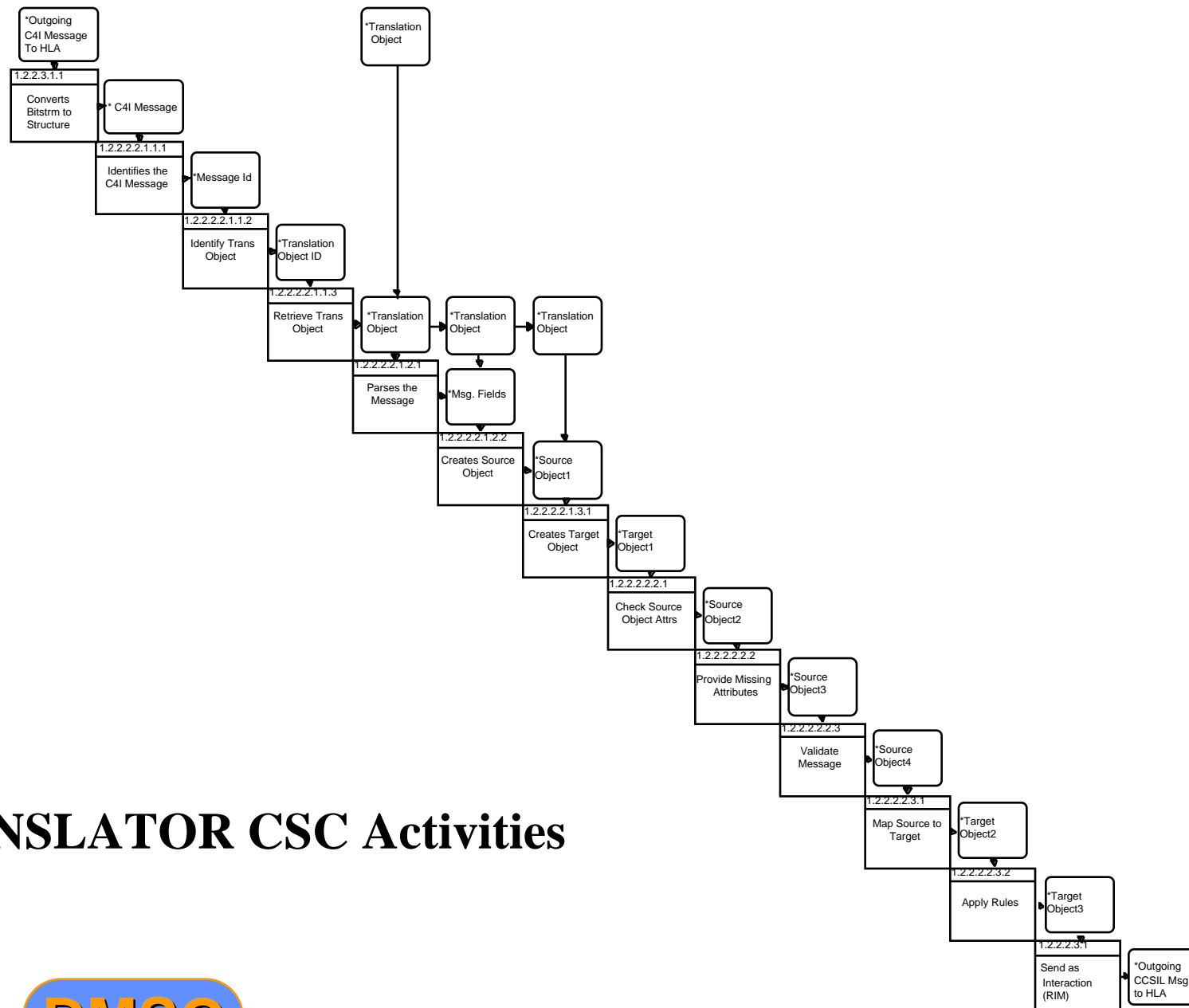
C4I System - to - HLA Federation N² Interface Design Depiction (3 of 5)



EXEC CSC Activities



C4I System - to - HLA Federation N² Interface Design Depiction (4 of 5)



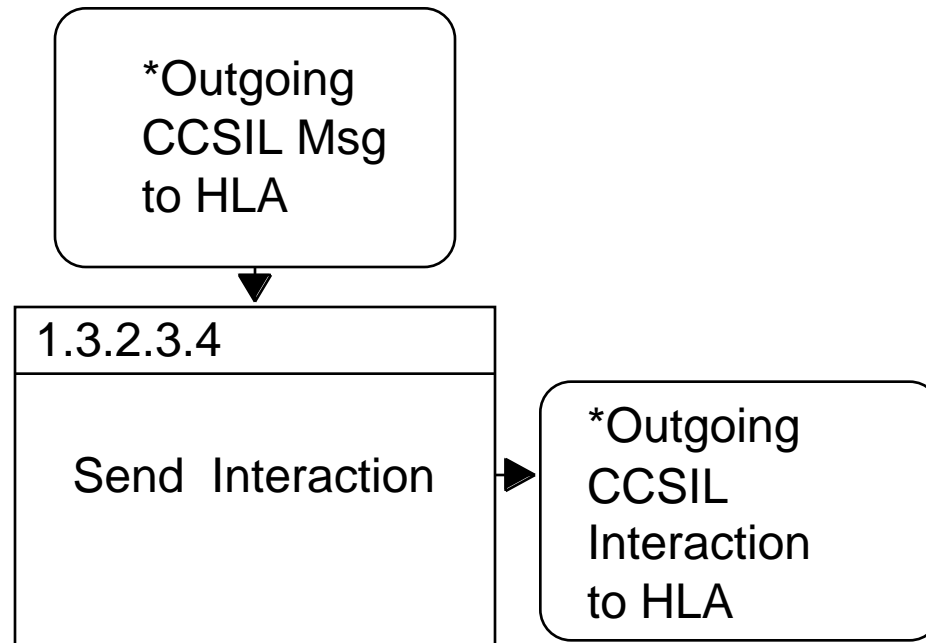
TRANSLATOR CSC Activities



MRCI Critical Design Review - 14 August, 1996



C4I System - to - HLA Federation N² Interface Design Depiction (5 of 5)



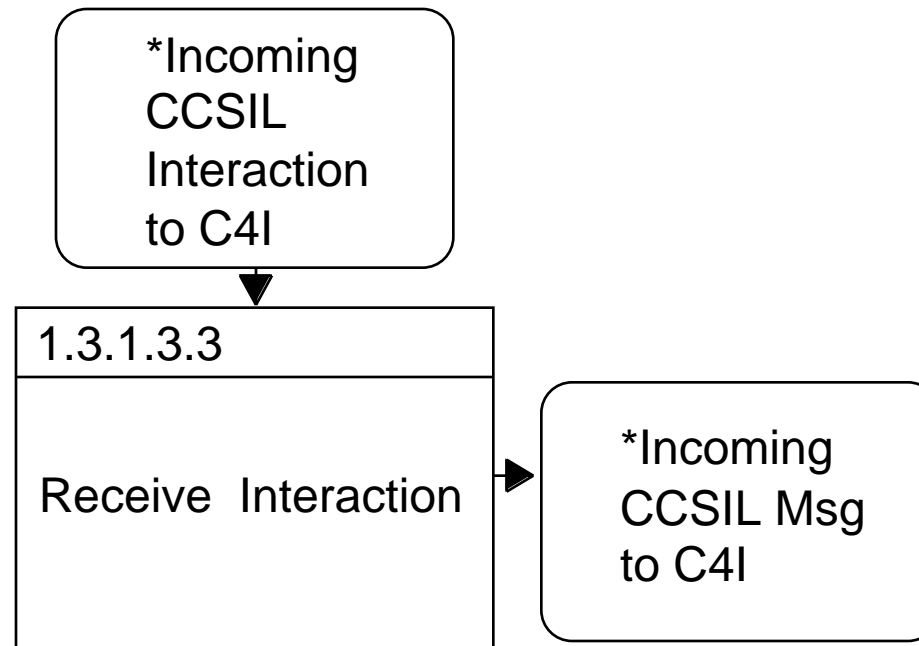
RTIAMB CSC Activities



MRCI Critical Design Review - 14 August, 1996



HLA Federation - to - C4I System N² Interface Design Depiction (1 of 5)



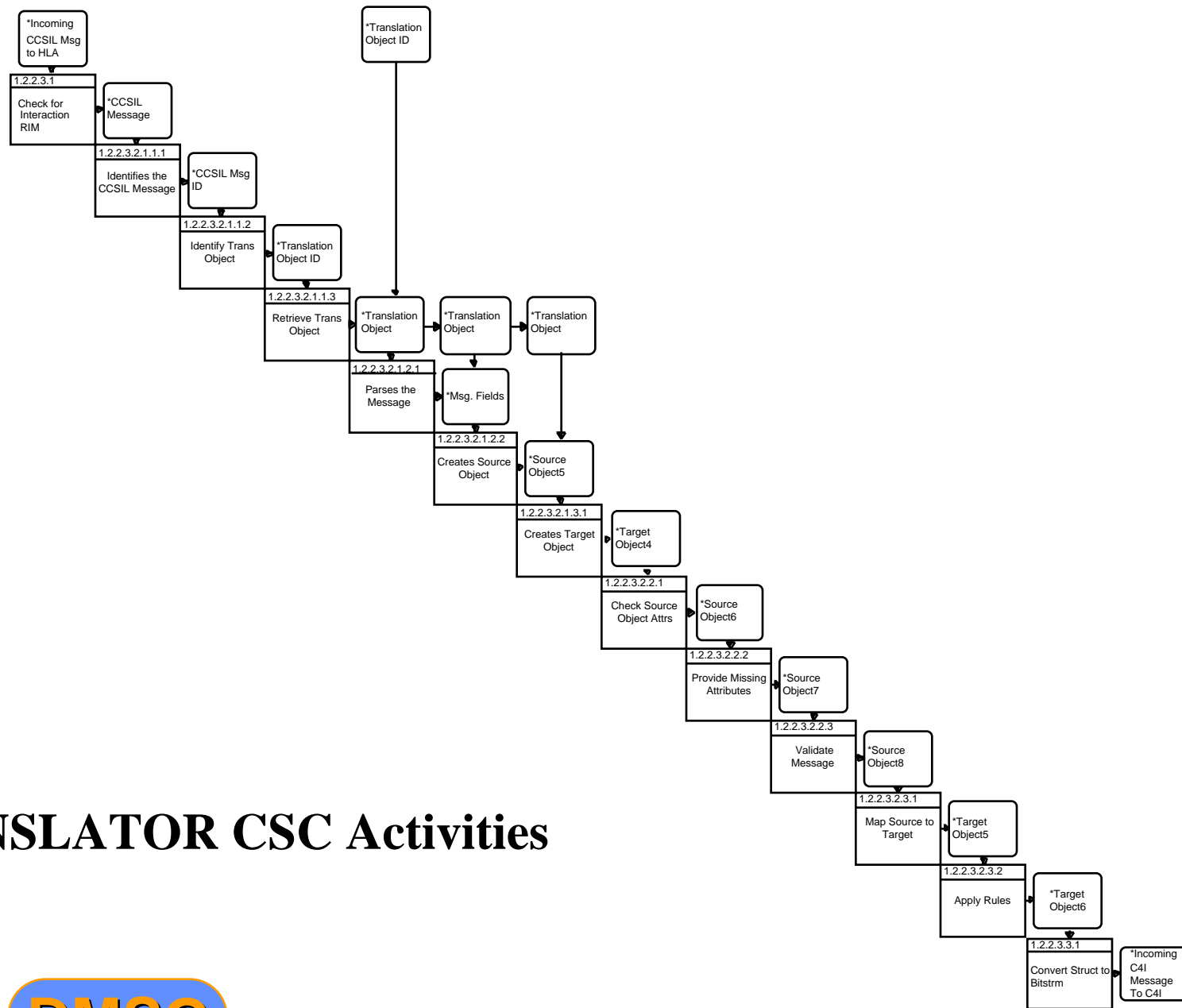
SIMAMB CSC Activities



MRCI Critical Design Review - 14 August, 1996



HLA Federation - to - C4I System N² Interface Design Depiction (2 of 5)



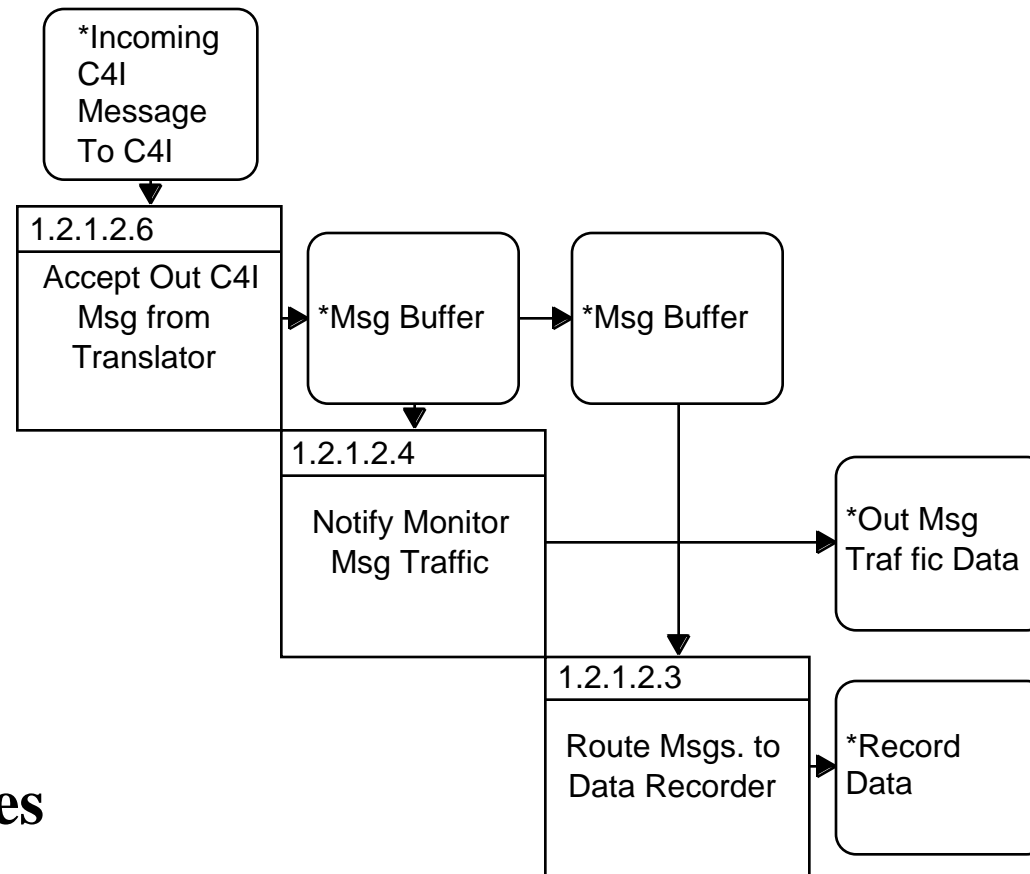
TRANSLATOR CSC Activities



MRCI Critical Design Review - 14 August, 1996



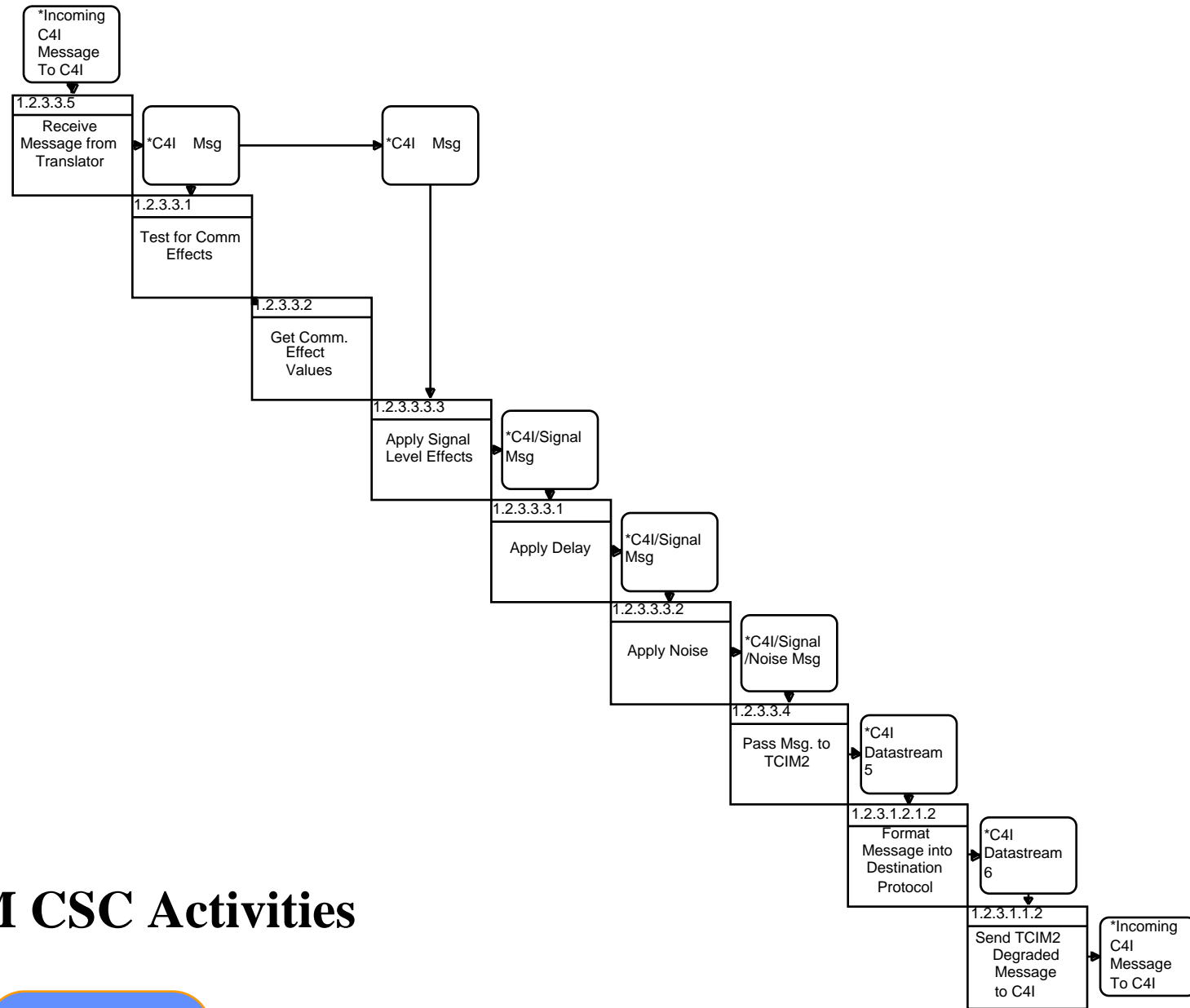
HLA Federation - to - C4I System N² Interface Design Depiction (3 of 5)



EXEC CSC Activities



HLA Federation - to - C4I System N² Interface Design Depiction (4 of 5)



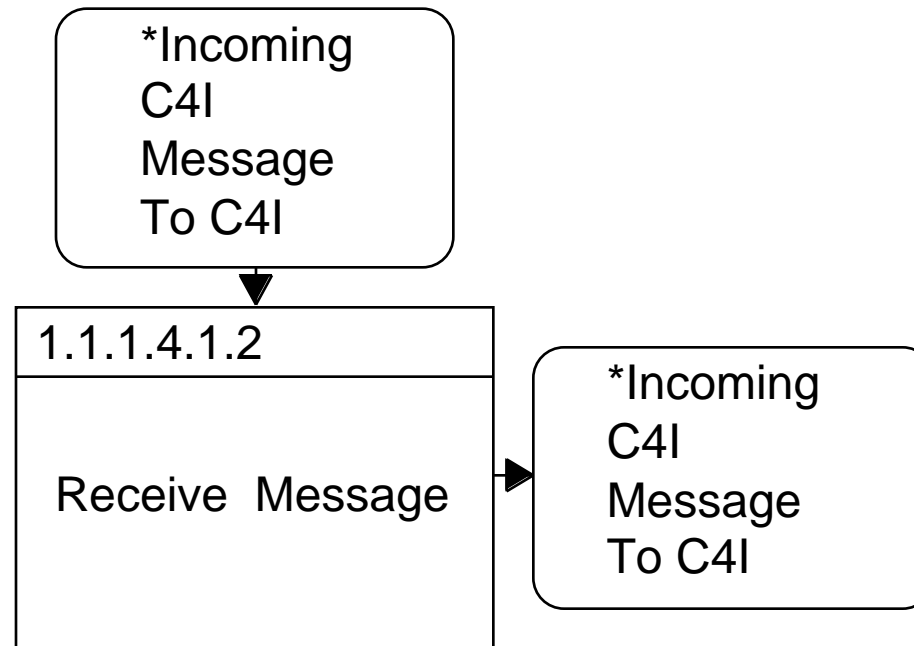
COMM CSC Activities



MRCI Critical Design Review - 14 August, 1996



HLA Federation - to - C4I System N² Interface Design Depiction (5 of 5)



API CSC Activities



MRCI Critical Design Review - 14 August, 1996



MRCI CDR Agenda (2 of 2)

1215-1345

System Specific Interface Design

Common Modules Interface Designs (to SSI & RIM)

RTI Interface Module (RIM) Design

➡ *1345-1400*

CSCI, CSC, CSU Development Status (i.e. existing or new development)

1400-1415

Requirements Traceability to SRR

1415-1500

Summary & Wrap Up



MRCI Critical Design Review - 14 August, 1996



CSCI, CSC, CSU Development Status

This portion of the briefing will refer back to the MRCI software hierarchy slides and point out the areas of potential software reuse from other programs and the areas where new development is expected.



MRCI Critical Design Review - 14 August, 1996



MRCI CDR Agenda (2 of 2)

1215-1345

System Specific Interface Design

Common Modules Interface Designs (to SSI & RIM)

RTI Interface Module (RIM) Design

1345-1400

CSCI, CSC, CSU Development Status (i.e. existing or new development)



1400-1415

Requirements Traceability to SRR

1415-1500

Summary & Wrap Up



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (1 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:														
Component	1	2	3	4	5	6	7	8	9	10	10-1	10-2	10-3	10-4	10-5
ALL	X		X	X	X	X	X	X	X	X					
SSI (1.1)															
API (1.1.1)		X													
API Initialization (1.1.1.1)															
MRCI Control (1.1.1.2)															
API Display Interface (1.1.1.3)															
API Comm Interface (1.1.1.4)															
API Clock Interface (1.1.1.5)		X													
API DB Interface (1.1.1.6)															
SSI Functions (1.1.2)															
C4I Display Interface (1.1.2.1)															
C4I Comm Interface (1.1.2.2)															
C4I Clock Interface (1.1.2.3)															
C4I DB Interface (1.1.2.4)															



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (2 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:														
Component	10-6	10-7	10-8	10-9	10-10	11	12	13	14	15	16	17	18	19	20
ALL										X	X	X	X	X	X
SSI (1.1)															
API (1.1.1)							X		X						
API Initialization (1.1.1.1)									X						
MRCI Control (1.1.1.2)															
API Display Interface (1.1.1.3)															
API Comm Interface (1.1.1.4)							X								
API Clock Interface (1.1.1.5)															
API DB Interface (1.1.1.6)							X								
SSI Functions (1.1.2)									X						
C4I Display Interface (1.1.2.1)															
C4I Comm Interface (1.1.2.2)															
C4I Clock Interface (1.1.2.3)															
C4I DB Interface (1.1.2.4)															



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (3 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:														
Component	21	22	23	24	25	26	27	28	29	30	31	32	33	33-1	34
ALL		X	X	X	X	X	X	X	X		X	X	X	X	X
SSI (1.1)															
API (1.1.1)										X					
API Initialization (1.1.1.1)															
MRCI Control (1.1.1.2)															
API Display Interface (1.1.1.3)															
API Comm Interface (1.1.1.4)															
API Clock Interface (1.1.1.5)															
API DB Interface (1.1.1.6)															
SSI Functions (1.1.2)										X					
C4I Display Interface (1.1.2.1)															
C4I Comm Interface (1.1.2.2)															
C4I Clock Interface (1.1.2.3)															
C4I DB Interface (1.1.2.4)															



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (4 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:												
Component	34-1	35	35-1	35-2	36	37	38	39	40	41	42	43	43-1
ALL	X	X		X	X				X	X			
SSI (1.1)													
API (1.1.1)			X			X						X	
API Initialization (1.1.1.1)													
MRCI Control (1.1.1.2)													
API Display Interface (1.1.1.3)			X			X							
API Comm Interface (1.1.1.4)													
API Clock Interface (1.1.1.5)												X	
API DB Interface (1.1.1.6)			X										
SSI Functions (1.1.2)													
C4I Display Interface (1.1.2.1)													
C4I Comm Interface (1.1.2.2)													
C4I Clock Interface (1.1.2.3)													
C4I DB Interface (1.1.2.4)													



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (5 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:														
Component	1	2	3	4	5	6	7	8	9	10	10-1	10-2	10-3	10-4	10-5
ALL	X		X	X	X	X	X	X	X	X					
CM (1.2)															
Executive (1.2.1)		X													
System Initialization (1.2.1.1)															
Message Handler (1.2.1.2)		X													
Data Recorder (1.2.1.3)		X													
Object Manager (1.2.1.4)															
Time Manager (1.2.1.5)		X													
Status Monitor (1.2.1.6)		X													
Translator (1.2.2)															
Translator Initialization (1.2.2.1)															
C4I-CCSIL Translator (1.2.2.2)		X													
CCSIL-C4I Translator (1.2.2.3)		X													
Communications (1.2.3)		X													
TCIM2 (1.2.3.1)		X													
Network (1.2.3.2)															
CSR (1.2.3.3)		X													



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (6 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:															
Component	10-6	10-7	10-8	10-9	10-10	11	12	13	14	15	16	17	18	19	20	
ALL										X	X	X	X	X	X	
CM (1.2)																
Executive (1.2.1)							X	X	X							
System Initialization (1.2.1.1)							X		X							
Message Handler (1.2.1.2)								X								
Data Recorder (1.2.1.3)								X								
Object Manager (1.2.1.4)																
Time Manager (1.2.1.5)																
Status Monitor (1.2.1.6)																
Translator (1.2.2)																
Translator Initialization (1.2.2.1)																
C4I-CCSIL Translator (1.2.2.2)																
CCSIL-C4I Translator (1.2.2.3)																
Communications (1.2.3)																
TCIM2 (1.2.3.1)																
Network (1.2.3.2)																
CSR (1.2.3.3)																



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (7 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:														
Component	21	22	23	24	25	26	27	28	29	30	31	32	33	33-1	34
ALL		X	X	X	X	X	X	X	X		X	X	X	X	X
CM (1.2)															
Executive (1.2.1)															
System Initialization (1.2.1.1)															
Message Handler (1.2.1.2)															
Data Recorder (1.2.1.3)															
Object Manager (1.2.1.4)															
Time Manager (1.2.1.5)															
Status Monitor (1.2.1.6)															
Translator (1.2.2)															
Translator Initialization (1.2.2.1)															
C4I-CCSIL Translator (1.2.2.2)															
CCSIL-C4I Translator (1.2.2.3)															
Communications (1.2.3)															
TCIM2 (1.2.3.1)															
Network (1.2.3.2)															
CSR (1.2.3.3)															



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (8 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:												
Component	34-1	35	35-1	35-2	36	37	38	39	40	41	42	43	43-1
ALL	X	X		X	X				X	X			
CM (1.2)													
Executive (1.2.1)			X									X	X
System Initialization (1.2.1.1)													
Message Handler (1.2.1.2)			X										
Data Recorder (1.2.1.3)			X										
Object Manager (1.2.1.4)													
Time Manager (1.2.1.5)												X	
Status Monitor (1.2.1.6)													
Translator (1.2.2)			X				X	X			X		
Translator Initialization (1.2.2.1)													
C4I-CCSIL Translator (1.2.2.2)			X				X				X		
CCSIL-C4I Translator (1.2.2.3)								X			X		
Communications (1.2.3)			X			X							
TCIM2 (1.2.3.1)			X			X							
Network (1.2.3.2)			X										
CSR (1.2.3.3)													X



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (9 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:														
Component	1	2	3	4	5	6	7	8	9	10	10-1	10-2	10-3	10-4	10-5
ALL	X		X	X	X	X	X	X	X	X					
RIM (1.3)															
SIM Ambassador Interface (1.3.1)		X											X	X	X
Declaration Management Receiver (1.3.1.1)		X											X	X	
Federation Management Receiver (1.3.1.2)		X											X	X	
Object Management Receiver (1.3.1.3)		X											X	X	
Ownership Management Receiver (1.3.1.4)		X											X	X	X
Time Management Receiver (1.3.1.5)		X											X	X	



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (10 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:														
Component	10-6	10-7	10-8	10-9	10-10	11	12	13	14	15	16	17	18	19	20
ALL										X	X	X	X	X	X
RIM (1.3)															
SIM Ambassador Interface (1.3.1)			X			X			X						
Declaration Management Receiver (1.3.1.1)						X			X						
Federation Management Receiver (1.3.1.2)						X			X						
Object Management Receiver (1.3.1.3)			X			X									
Ownership Management Receiver (1.3.1.4)			X			X									
Time Management Receiver (1.3.1.5)						X			X						



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (11 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:														
Component	21	22	23	24	25	26	27	28	29	30	31	32	33	33-1	34
ALL		X	X	X	X	X	X	X	X		X	X	X	X	X
RIM (1.3)															
SIM Ambassador Interface (1.3.1)	X									X					
Declaration Management Receiver (1.3.1.1)										X					
Federation Management Receiver (1.3.1.2)										X					
Object Management Receiver (1.3.1.3)	X									X					
Ownership Management Receiver (1.3.1.4)										X					
Time Management Receiver (1.3.1.5)										X					



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (12 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:												
Component	34-1	35	35-1	35-2	36	37	38	39	40	41	42	43	43-1
ALL	X	X		X	X				X	X			
RIM (1.3)													
SIM Ambassador Interface (1.3.1)												X	
Declaration Management Receiver (1.3.1.1)													
Federation Management Receiver (1.3.1.2)													
Object Management Receiver (1.3.1.3)													
Ownership Management Receiver (1.3.1.4)													
Time Management Receiver (1.3.1.5)												X	



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (13 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:														
Component	1	2	3	4	5	6	7	8	9	10	10-1	10-2	10-3	10-4	10-5
ALL	X		X	X	X	X	X	X	X	X					
RIM (1.3)															
RTI Ambassador Interface (1.3.2)		X											X	X	X
Declaration Management Sender (1.3.2.1)		X											X	X	
Federation Management Sender (1.3.2.2)		X											X	X	
Object Management Sender (1.3.2.3)		X											X	X	
Ownership Management Sender (1.3.2.4)		X											X	X	X
Time Management Sender (1.3.2.5)		X											X	X	
Federation Execution (1.3.2.6)		X									X	X	X	X	X



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (14 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:														
Component	10-6	10-7	10-8	10-9	10-10	11	12	13	14	15	16	17	18	19	20
ALL										X	X	X	X	X	X
RIM (1.3)															
RTI Ambassador Interface (1.3.2)			X			X			X						
Declaration Management Sender (1.3.2.1)						X			X						
Federation Management Sender (1.3.2.2)						X			X						
Object Management Sender (1.3.2.3)			X			X									
Ownership Management Sender (1.3.2.4)			X			X									
Time Management Sender (1.3.2.5)						X			X						
Federation Execution (1.3.2.6)	X	X	X	X	X	X									



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (15 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:														
Component	21	22	23	24	25	26	27	28	29	30	31	32	33	33-1	34
ALL		X	X	X	X	X	X	X	X		X	X	X	X	X
RIM (1.3)															
RTI Ambassador Interface (1.3.2)	X									X					
Declaration Management Sender (1.3.2.1)										X					
Federation Management Sender (1.3.2.2)										X					
Object Management Sender (1.3.2.3)	X									X					
Ownership Management Sender (1.3.2.4)										X					
Time Management Sender (1.3.2.5)										X					
Federation Execution (1.3.2.6)	X									X					



MRCI Requirements Traceability Matrix to CSCI's, CSC's, & CSU's (16 of 16)

Top row indicates those requirements that all CSU's and/or CSM's contribute to satisfying. Individual CSU/CSM lines indicate additional requirements that the particular CSU/CSM contributes to satisfying.

	MRCI System Requirement Number:												
Component	34-1	35	35-1	35-2	36	37	38	39	40	41	42	43	43-1
ALL	X	X		X	X				X	X			
RIM (1.3)													
RTI Ambassador Interface (1.3.2)			X									X	
Declaration Management Sender (1.3.2.1)													
Federation Management Sender (1.3.2.2)													
Object Management Sender (1.3.2.3)													
Ownership Management Sender (1.3.2.4)													
Time Management Sender (1.3.2.5)												X	
Federation Execution (1.3.2.6)													



MRCI General and Technical Requirements (1 of 13)

1. MRCI execution should be transparent to the user and non-intrusive to the C4I system during setup and use.
2. MRCI shall be able to operate in real time and/or at a speed which results in the perception of real time (perceptible real time) to the C4I system using the MRCI. MRCI must not preclude or inhibit the use of time management schemes supported by the RTI.
3. MRCI shall operate with dynamic changes in C4I systems task organization and in all mission threads (e.g. planning through BDA and replanning to retasking).
4. MRCI shall operate during, and recover from, system failures on either its RTI or live C4I side.
5. MRCI shall support C4I systems representing echelons above Corps to platform level, e.g. infantryman operating autonomously.



MRCI General and Technical Requirements (2 of 13)

6. MRCI shall not restrict the HLA Federation operations with respect to security level.
7. MRCI operation shall not be constrained by data, information or C2 formats and shall not introduce additional layers of complexity to the simulation interfaces to the RTI.
8. MRCI shall be able to go to war and operate across operational warfighting networks.
9. MRCI shall support bi-directional interactions between C4I systems and the HLA-based Federation.
10. MRCI shall comply with the five Federation and five Federate rules of the HLA.
- 10.1 Federations must have an HLA Federation Object Model (FOM), documented using the HLA OMT.



MRCI General and Technical Requirements (3 of 13)

- 10.2 In a federation, all object representation (ownership or reflection) occurs in the federates, not in the runtime infrastructure (RTI).
- 10.3 During a federation execution, data exchange (attribute values and interactions) among instances of objects defined in the FOM represented (owned or reflected) in different federates occurs via the RTI).
- 10.4 During a federation execution, federates must interact with the runtime infrastructure (RTI) in accordance with the HLA interface specification.
- 10.5 During a federation execution, an attribute of an instance of an object can be owned by only one federate at any given time.
- 10.6 Federates must have an HLA Simulation Object Model (SOM) documented using the HLA OMT.



MRCI General and Technical Requirements (4 of 13)

- 10.7 Federates must be able to publish/reflect any attributes of objects in their SOM and exercise SOM object interactions externally.
- 10.8 Federates must be able to own or reflect attributes and to transfer/accept ownership of attributes dynamically during a federation execution, as specified in their SOM.
- 10.9 Federates must be able to vary the conditions (e.g. thresholds) under which they provide updates of public attributes of objects according to their SOM.
- 10.10 Federates must be able to manage local time in a way which will allow them to coordinate data exchange with other members of a federation in accordance with at least one HLA time management service.



MRCI General and Technical Requirements (5 of 13)

11. MRCI must facilitate interoperation with an HLA federation using all five RTI service categories. i.e. Federation Management, Time Management, Object Management, Ownership Management and Declaration Management.
12. MRCI shall provide the throughput and transport capabilities to facilitate the rapid exchange and synchronization of C4I and Simulation databases (database reconciliation) as executed by the future HLA exercise generation components.
13. MRCI shall facilitate the collection of both FOM and non-FOM data as defined within the C4I system SOM.
14. MRCI shall facilitate the establishment of an application-to-application session between the RTI and the C4I system.



MRCI General and Technical Requirements (6 of 13)

- 15. MRCI shall provide a mechanism for resynchronization with C4I systems following degraded operations (e.g. tactical picture re-establishment).
- 16. MRCI shall be GCCS DII COE compliant.
- 17. MRCI applications shall be fully interoperable with Ada 95.
- 18. MRCI shall support next generation releases of C4I system software (e.g. MCS/P Baseline Build V, Block III; AFATDS V1.0.06).
- 19. The MRCI/C4I SOM shall support FOMs produced for STOW demonstrations and exercises which include CBS, OpenSAF, EADSIM participation and entity-level interactions.



MRCI General and Technical Requirements (7 of 13)

20. To the extent practical, MRCI reconfigurable modules shall be reusable among instances of C4I-MRCI combinations.
21. MRCI shall support flow of both perceived and ground-truth data, information and C2 transactions consistent with applicable FOM and SOM definitions for Federations in which it participates.
22. MRCI design shall not be restricted by the use of legacy simulation-to-real world interface solutions.
23. MRCI design shall not be restricted by the use of alternate redundant mechanisms to the RTI.
24. MRCI shall be developed using a language for specification of formats, timing and conversion requirements of data, information and C2 interchange in clear, consistent and concise interface specifications of internal and external interfaces.



MRCI General and Technical Requirements (8 of 13)

- 25. MRCI shall use well-defined application program interface between layers and the support services.
- 26. MRCI shall optimize the interdependencies between software components so that the impact of change is localized.
- 27. MRCI shall reduce the number of, and special training required for, system administrators, network administrators, and other exercise support personnel.
- 28. MRCI shall minimize life-cycle costs and be logistically supportable.
- 29. MRCI shall be flexible, extensible, and modifiable to capitalize on current and emerging industry accepted standards and commercially available products to the maximum extent possible to support the system requirements and to streamline upgrades.



MRCI General and Technical Requirements (9 of 13)

- 30. MRCI shall provide sufficient flexibility, modifiability and performance to support changes and extensions to the interfaces on both the C4I and RTI sides.
- 31. MRCI shall execute in a distributed manner across heterogeneous platforms including current warfighting systems.
- 32. MRCI software shall be portable to different vendor host platforms with minimal or no modifications.
- 33. MRCI shall provide an experimental capability to interface AWSIM/R to TBMCS IAW the TBMCS SOM.
- 33.1 MRCI shall provide the capability of the current PRW and CWIC interfaces.
- 33.2 MRCI shall provide the capability to interface existing simulations with current and rapidly-prototyped C4I systems.



MRCI General and Technical Requirements (10 of 13)

- 34. MRCI shall provide an experimental capability to interface NASM/AP to TBMCS.
- 34.1 MRCI shall provide the capability to be used with next generation simulations and the Prototype Federation products.
- 35. MRCI shall provide an experimental capability to interface AFSAF to TBMCS.
- 35.1 MRCI shall support the parsing and transmission of ATO/ACO for virtual mission planning and execution within AFSAF.
- 35.2 MRCI shall support operations in Federations where STOW SEID SI and OpenSAF are used IAW the appropriate FOM.
- 36. The design of the MRCI shall not preclude the addition of a module to support direct C4I system database access (vice message interchange) when specified in future C4I SOMs.



MRCI General and Technical Requirements (11 of 13)

- 37. MRCI must support segregation, labeling and simultaneous existence of live and simulation data within all of its modules and in all of its outputs on both C4I and RTI sides.
- 38. MRCI must support the populating of messages with relatively unstructured text content to the C4I system and within the CCSIL-like message converter, while correctly maintaining the intent of such messages.
- 39. MRCI must support interpreting messages with relatively unstructured text content from the C4I system and within the CCSIL-like message converter, while correctly maintaining the intent of such messages.



MRCI General and Technical Requirements (12 of 13)

- 40. The Federation Design in which the MRCI participates must accommodate scaling, normalizing or otherwise harmonizing data and information transactions where “detail mismatches” would result in unrealistic representations of the battlespace to the C4I system.
- 41. MRCI must provide functionality compatible with the STOW SSF and data collection facilities in support of STOW FOMs.
- 42. MRCI must maintain content integrity and conformity in all internal data-to-data/ information-to-information/ C2-to-C2 transformations.
- 43. MRCI must not introduce spatial or temporal inconsistencies into the C4I system’s “world view”.



MRCI General and Technical Requirements (13 of 13)

- 43.1 Via the MRCI, simulated entities must be able to affect the live C4I systems and vice versa. Simulated entities must also be able to control communications between live C4I systems; data, information, and C2 flow between live and simulated world shall be influenced in quantity and quality based on environment, geometric, physics and other connectivity determinants computed elsewhere in the Federation.



MRCI CDR Agenda (2 of 2)

1215-1345

System Specific Interface Design

Common Modules Interface Designs (to SSI & RIM)

RTI Interface Module (RIM) Design

1345-1400

CSCI, CSC, CSU Development Status (i.e. existing or new development)

1400-1415

Requirements Traceability to SRR



1415-1500

Summary & Wrap Up

